SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LII.—No. 1.] [NEW SERIES.] NEW YORK, JANUARY 3, 1885. (6015-9) [$3.20 per Annum. [POSTAGE PREPAID.]

THE MANUFACTURE OF LINEN PAPERS AND PAPER WARES.—[See page 6.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included.................................. $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin street, New York

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates. —The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars.* Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 361 Broadway, corner of Franklin street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information: (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin street, New York

NEW YORK, SATURDAY, JANUARY 3, 1885.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 470,

For the Week ending January 3, 1885.

Price 10 cents. For sale by all newsdealers.

The New Orleans Exposition.

Although the work of getting the Exposition in good running order has seemed to progress very slowly since the official opening, December 16, the magnitude of the task imposed upon the management is thereby made more apparent. The enterprise is a far larger one than anybody had anticipated would be the case. There are from nine to ten thousand exhibitors, and the buildings were by no means ready to receive all the exhibits on opening day. Many of the exhibitors were themselves much behind time, but probably the worst cause of complaint has been the delay of the railroads in promptly handling the five thousand and more car loads of exhibits.

Among the most important of the exhibits shown is that of the Baldwin Locomotive Works. It includes specimens of the leading types of locomotives made at the works, both passenger and freight, illustrating the various patterns which have been most popular, as the "American," the "ten-wheeled," the "Mogul," and others. In connection with their exhibit the firm publish a handsome catalogue giving particulars of the dimensions, weight, and tractive power of their different sizes and patterns of locomotives, with indicator diagrams and statistics of performance.

The Panama Canal and its Climatic Results.

Considerable has been written on the possible results of the Panama Canal upon the ocean currents, and its likely effect upon the climate of the Pacific coast.

Dr. M. O. Baldwin, in the Kansas City *Review of Science* for December, has an article on this topic, in which he says that the attention of the whole civilized world is, and deservedly so, directed at the present time to this great work and the benefits to commerce and civilization which will result therefrom.

"It is not the purpose," the writer adds, "to treat of these, but to direct attention to the possible physical changes upon the earth's surface which may be brought about by the completion of this canal."

"The surface of the ocean on the Pacific side of the Isthmus is about fifteen feet higher than it is on the Atlantic. This elevation of the waters of the Pacific above those of the Atlantic is maintained, it is probable, by the peculiar direction of the Pacific Ocean currents, which, while they carry forward to this point very great bodies of water, impede, and to a great extent obstruct, their return. The consequence of this must be that upon the completion of the canal, which is to be, it is understood, a tide water canal, there will be created a current from the west eastward, through the Isthmus.

"The length of the canal will be about thirty-three miles, consequently there will result a fall approaching closely six inches per mile. The pressure of so great a body of water as is found in the Pacific will give to this current in the canal a much greater rapidity than will exist in the current of a stream wherein we have the same degree of inclination. The result of this will be that the shores and bottom of the canal will be rapidly cut away.

"Now let us consider briefly the currents of the ocean. There exists in the Pacific Ocean the great Japanese current, which sweeps from the coast of Japan northward, and is divided upon the Aleutian Islands, on the coast of Alaska, a portion passing through Behring Straits and a portion finding its way down the western coast of the continent as far south as Central America, where it is deflected westwardly to join and again return with the currents from the South Pacific which are diverted from Australia and the Philippine Islands and form a current which passes directly eastward to the Isthmus of Panama. This current in its passage eastward is joined by yet other currents from the great South Pacific currents which sweep up the west coast of South America, and together these form the great equatorial counter current, and the entire force of this mighty stream is broken and expended upon the western shores of the Isthmus.

"It is an evident condition that these ocean currents are directed in their course by the coast barriers with which they are brought in contact. If then these barriers are by any means removed or changed, there will result a corresponding change in the direction of the currents.

"We have then this condition: with the waters of the Pacific already at a considerable elevation above those of the Atlantic, a current from the west eastward seems inevitable, and with the added force which will be thrown in by the currents from the Pacific, the canal must be rapidly worn away until it is probable a considerable portion of the Isthmus will have been destroyed, and the great Pacific current, the force of which is now expended upon the western shores of the Isthmus, will find its way through into the Gulf and be joined to the Gulf Stream.

Should this be the result, we can only expect that the great thermal currents from the Pacific, which have heretofore so greatly modified the climate of our Pacific coast, will undergo a change in their directions, and the great body of heated waters, finding its way through the Isthmus, will pass northward with the Gulf Stream along our Atlantic coast until it is directed upon the coast of Newfoundland, and, crossing the Atlantic, it passes the shores of Great Britain and Iceland, expending itself, and upon the frigid shores of northwestern Europe will carry with it an elevation of temperature which will modify to a great extent the climate of those regions.

"It is a well known fact that an extended portion of the Arctic world has been at some time habitable and inhabited. This is shown by the finding so frequently the remains of tropical plants and animals in the far north. It is equally known that great convulsions of nature have taken place whereby continents and oceans and ocean currents have been changed, and these conditions have brought about these great changes in climates. It cannot then be considered an unreasonable hypothesis, that the results which have followed natural causes shall also succeed artificial means when the elements necessary are at hand.

"Permit a digression, to direct attention to the fact, as has been indicated above, that the current of this canal will be such that in the course of time it will result in the destruction of a considerable portion of the Isthmus. In that case the canal company will find a difficulty in making the investment a source of profit, as the canal will soon have overreached their boundaries, and will become a public highway, a great waterway for the shipping of the world."

Chemical Explosion on a Railway Train.

On Dec. 5, as a mixed train on the Kingston and Pembroke road was near Verona, Ont., running at a high rate of speed, an explosion occurred near the stove in the rear of the passenger car. It was thought at first that the stove had fallen down, but instantly the car was lighted up with a bright flame. A suffocating gas which filled the car caused an immediate rush for the door by the terrified passengers, who fled leaving their traps. The platform, steps, and doorway of the car were soon jammed, and numbers were held back, unable to get out for some time. During the panic the bell rope, by being pulled on from both sides, broke, without giving a signal to the engineer to stop. The train was rushing along at 30 miles an hour, and it was with difficulty that the passengers were prevented from jumping off. In the mean time some one ran through the baggage car and, shouting over coal cars, brought the engineer to a sense of the danger, and he brought the train to a stop.

Passengers and train hands then put out the fire with water procured in the ditches by the wayside. The accident was caused by some passenger placing a parcel near the stove which is supposed to have been a large bottle of phosphoric acid. The person who put it there declared he did not know its contents, and was bringing it to a school teacher. It was very fortunate it was placed at the back instead of the front end of the car, otherwise the passengers would have been forced to jump off the train, and great loss of life must have followed. As it was, some of them suffered severely from inhaling the gas. Several seats in the car, the floor, and the valises and clothing left by the passengers were burned.

Professor Bell.

Alexander Graham Bell, who has now been pronounced the first inventor of the working telephone by every court but the Supreme Court of the United States, and who expects to win in the latter court as in the others, is not perceptibly elated by his success, writes a Washington correspondent to the *Philadelphia Record*. He bears prosperity as well as any man I ever knew. He is immensely rich, and by his invention all the members of his family have been enriched. But Bell is just the same cheery, eager, hard working devotee of science that he was back in the old days of his poverty and obscurity. Bell cares nothing for money as money. He is not a money maker. Like Agassiz, and all other great scientists, he is "too busy to make money." Of course, he likes the things that money will provide—his handsome house on Scott Circle, with all its elaborate conveniences, its elegant furnishings, and its beautiful works of art, his workshop, the "Volta Laboratory," on Connecticut Avenue, his apparatus, and his library. But he would be just as happy without them.

His happiness lies in his family on one hand, and in his scientific pursuits on the other. When he is not busy in his laboratory, or in his library, or in the free school for deaf mute children which he has established, he is enjoying the society of his wife and children. They are a delightful family. The man who has made the Bell telephone the splendid business success that it is, is Bell's father-in-law, Gardiner G. Hubbard, a man of very great business ability, who lives in a handsome house on Dupont Circle, opposite Blaine's castle. He is as practical as Bell is theoretical. He, too, is very rich. A Boston man told me the other day that it was understood in Boston that Hubbard made $500,000 by the recent rise in Bell telephone stock. Hubbard is a very agreeable old gentleman, who still writes a good deal for the reviews and magazines, as he used to do when he was a professor in Cambridge on a small salary.

Burnt Iron and Steel.

The nature of the change called "burning" in iron and steel has been treated of in the *Jahrbuch fur den Berg-und Huttenmann.* Iron that has been raised to near its melting point, and then slowly cooled, is both hot short and cold short, and shows a coarse, crystalline structure and a glistening fracture. The iron contains oxygen; though the oxygen is not derived from the hot air in the fire during the process of burning, but is developed from the slag previously mixed with the metal. When the iron is near the melting point, a chemical reaction goes on in its substance, whereby the sesquioxide is reduced to protoxide, and this is dissolved through the bulk of the metal, and alters its properties. The coarse, crystalline quality of the iron already mentioned is not due to the presence of oxygen, but to the phosphorus, which causes crystallization while the metal is cooling. The greater the proportion of phosphorus, the more danger there is of burning the iron. The phosphrous renders the metal cold short; and oxygen, though it does not greatly affect the working of the metal when cold, acts like sulphur on its malleability when hot.

Steel is burnt through the presence of carbon; the richer it is in carbon, the greater the risk of burning. This is as much as saying that the harder the steel the more carefully it is to be worked in the fire. Steel, when overheated, becomes coarse grained and brittle; if the temperature is increased still more, showers of sparks are thrown off, and the metal is said to be burnt. Burnt steel does not show, upon analysis, a diminution in the proportion of carbon; but the presence of manganese and silicon is more important than carbon. If steel containing all three substances is heated, it is the two former that first become oxidized. An important change is thus made in the properties of the metal. The carbon is oxidized later, and escapes; while the oxides of manganese and silicon remain, and the whole molecular structure of the steel is changed. If the heating process is continued, the iron itself is next oxidized. Every one must have noticed the altered appearance of cast metal that has been subjected for any length of time to intense heat.

A cast iron furnace door, after having been exposed for many years to the flame of a coal fire, was found to contain 27·8 per cent of oxygen in combination with iron, sulphur, nickel, copper, phosphorus, and arsenic. The cause of the sparking when steel is burnt is not, as might be supposed, the combustion of the carbon, but the escape of gases previously imprisoned in the metal, or rather developed by the heat which it endures. The alteration of the nature of steel may be brought about by exposure for a lengthened time to heat below that required to visibly burn it. The metal is killed all the same by the violent or slow process. No restoration of burn iron or steel by mere mechanical means is practicable, since its original chemical constitution cannot be recreated in this way.

Home Nursing.

Among many other excellent suggestions on this subject, a lady contributor to *Chambers's Journal* urges the importance of a written record being kept by the sick room attendant. A watchful nurse will be quick to notice any change in her patient; but it is quite one thing to notice, and another to give, a faithful report of what has been observed; and every experienced nurse, at least, should be very particular in jotting down at once all that strikes her attention. The simplest way of doing this is to keep a sort of diary of all that happens. Take a piece of writing paper, keep one side for day and one for night, write the date at the top, crease it down the middle, and note on one-half all the patient takes and does, and on the other anything you think demands notice. The following is a specimen of the sort of chart suggested:

October 4.

A.M.	A.M.
8. Cup of tea and toast.	
10. Four ounces of milk.	10. Milk taken with difficulty and dislike.
11. Medicine.	
11.15. Poultice to chest and back.	
11.30. Slept twenty minutes.	11.30. Turned on right side before going to sleep.
12. Four ounces beef tea.	
12.30 Mrs. A. called, stayed quarter of an hour.	12.45—1.30. Excited and depressed by Mrs. A.'s call.

Are visitors to be allowed?

The reverse side might read thus:

October 4.

P.M.	P.M.
8. Four ounces milk.	
9. Jacket poultice.	
9.30. Dozed half hour.	9.30. Skin hot and dry, face flushed; woke excited and restless.
10. Opiate as directed.	
10.45. Slept two hours.	11.30. Began to perspire, expression tranquil; woke refreshed.
12.45. Four ounces milk.	

To keep such a chart properly requires some practice, but it is the only way of insuring accuracy, and it will also save a good deal of questioning on the doctor's part, a glance being enough to show him how matters stand.

At the bottom of the first page, it will be noticed there is a question, which, unless so marked, would very likely be forgotten; and whenever the nurse is in any difficulty or uncertainty, she must never hesitate to ask for guidance. The doctor will not expect perfection from inexperience, and, even if he does not volunteer information, will certainly not object to answering reasonable questions. Of course, there is a great deal of difference in this as in all things, and there are doctors who take for granted everybody knows certain things, of which even the intelligent, who have not had their attention called to nursing, may be quite ignorant. But even when this is the case, the nurse's object being her patient's good and not the support of her own dignity, if she is not sure of her ground, it is her duty to ask for instruction.

The Inventor and the Machinist.

In the production of every machine two talents are brought into requisition—the inventive talent and the mechanical talent. The inventor and machinist may be one and the same person, but it is more frequently the case that the inventor is not a machinist, and the latter not an inventor, in the broad acceptation of that term. The skill requisite to plan and devise a machine is of a far different order from that required to fashion its parts and to assemble them. The inventor deals with ideas, with great mechanical principles. His is a work of discovery—a logical proceeding dealing with causes and effects. It is not absolutely necessary that he be able to make a single part of the machine which he invents, although it were better could he do so, as, the more familiar he is with the details of mechanical construction, the easier is it for him to accomplish his desired ends. A true inventor reads a machine as he would a book. His eye takes in every part with a glance, and the objects and purposes of the machine are as clear as day to him.

The machinist, on the other hand, may work for weeks on the separate parts of a machine and yet not know the true principle upon which it is constructed. He may be able to do his own work with skill, which work may be perfectly adapted to the object intended, and may be fashioned and fitted with the utmost accuracy and bear a finish that rivals the best workmanship; and still he may not have a clear conception of the purposes for which it is adapted. We are speaking of machinists whose mechanical skill exceeds their inventive ability. Such machinists are perhaps good workmen, understanding in a general way the ordinary uses and purposes of the articles they make; but when called to exercise their calling in the higher realms of their art, they fall short of understanding the aims of and purposes of the inventor, although they can work with a nicety to his plans. This proposition is more truly correct of the common workman than of the one who is called upon to erect the machine, for the latter must be a poor observer if he is capable of placing all the parts of a machine in correct position and yet does not understand their ultimate operation and use.

The work of the inventor is in the domain of speculative thought. The work of the machinist is, on the other hand, of the most practical character. The latter is the complement of the former. What the one conceives in his mind the other materializes in wood and iron. The inventor carries his speculations into new fields. The machinist follows him in his adventures, and at every step stands ready to execute his designs. Without the latter the inventor would be powerless to accomplish his purposes. It is a useless speculation, the determination of which position is the more valuable, that of the inventor or the machinist, because each is necessary to the other.

The more mechanical skill the inventor possesses the better is he equipped for his work. To be able to make a machine as well as devise it is a double acquirement. In fact, it seems essential that the best inventors should possess a certain degree of mechanical skill. The training necessary to obtain it is highly beneficial in showing him the properties of the material of which his machine will be made, and the difficulties in the way of adapting means to ends in bringing it forth.

The inventor not unfrequently meets with trouble in the machine shop, owing to the fact that the true principle of his invention is not grasped by those attempting to execute his orders. The result is that work has to be undone, delays occur, and the cost of construction is greatly enhanced. The fault is sometimes that of the inventor, who has not sufficient knowledge of shop work to give the proper instructions for producing the exact article desired. In such instance it is a cut-and-try experiment until the desired end is reached.

It is evident that the nearer the inventor approaches perfection in mechanical skill, and the nearer the machinist approaches the position of the inventor, the better for both. This can be done. Study and observation and the best use of particular faculties called in play, either in the workshop or in the inventor's laboratory, will accomplish the result desired.

* *The Industrial World.*

The Washington Monument.

Thirty-six years ago the foundations of the Washington Monument were laid on the bank of the Potomac River, and a few days ago the structure was completed. On the 22d of next February—the 153d anniversary of Washington's birth—this monument is to be dedicated with appropriate ceremonies. It may interest our readers to know that this great shaft of stone and marble is now the highest structure in the world—555 feet. The great Pyramid of Egypt is 480 feet; the tower of the Cathedral at Strassburg, 468 feet; the spire at Landshut, Germany, 465 feet; the dome of St. Peter's Cathedral, at Rome, 457 feet; the pyramid of Chephren, 454 feet; and St. Stephen's, at Vienna, 441 feet. The monument stands on an open space, squares away from any building. There is nothing to obstruct the view of it from the rear of the White House or the east end of the Treasury Building; and there is nothing between it and the Potomac River.

A Specimen of American Progress.

Thirty-five years ago, remarks the *Commercial Advertiser*, the name of St. Paul, Minn., was unknown to map makers, and neighboring Minneapolis could not boast of a single building. To-day each of these cities has a population little short of 100,000 souls, and each is the center of of a robust growth in trade, manufactures, and intellectual activity. There were buildings erected in the twin cities during the present year at a cost of nearly $15,000,000, and there would seem happily to be no interruption of any sort in their career of solid prosperity. Truly in no other country could so amazing and proud a sight be seen as St. Paul and Minneapolis now present. Among other nations progress in city making is the growth of centuries. With us a first class metropolis may sometimes almost magically arise in the course of a single generation.

To Tan Skins with Fur On.

Inquiry is frequently made at this office for the best recipe for tanning the skins of animals without injury to the fur. Isaac H. Bailey, and he is authority in such matters, publishes the following formulas for accomplishing this in his *Shoe and Leather Reporter:*

Take two parts each of alum and salt, and one of saltpeter, all well pulverized. Clear the flesh of fatty matter. Sprinkle it white with the mixture. Fold in edges and roll up; remain four days, then wash with clean water, and then with soap and water. Pull the skin when drying, to make it soft.

Another recipe is: Lay the wet skin on a smooth slab or a hard board; scrape with a dull knife until all loose flesh and film is removed; then wash off in soft water. Take a glass or stone jar, put in an ounce of oil of vitriol and a gallon of rain or river water. Let it steep in this for about half an hour. Take it out, work it with the hands until dry, when it will be pliable and soft. The more worked the softer. Use no grease.

Chimneys.

A soundly-built chimney vibrates, or swings from side to side, as a whole, under sudden and violent shocks of wind, and is in reality safer when it does so than when it stands in sullen and unmoved resistance. The vibration indicates that the several constituent parts of the structure are firmly compacted into one coherent, continuous, and, as it were, homogeneous mass, which can sway from side to side like a steel rod or spring, without any tendency to dissolve its continuity and break asunder at some intermediate point.

The absence of vibration, on the other hand, means that there is not this integrity of coherence, and that there are, so to speak, fissures of substantial continuity in the structure, at which disruptive strain is unavoidably developed. Sudden shocks of wind bursting upon lofty columns of brick-work in such circumstances tend to break them across at the joints where the interruption of continuity occurs. The movements of vibration are there absorbed, and converted into the less desirable condition of molecular strain.

Writing and Lettering upon Steel.

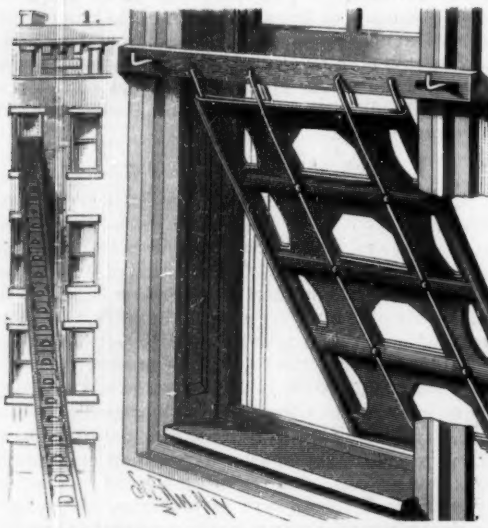
Steel can be written upon or engraved by first cleaning it with oil and then spreading a coating of melted beeswax upon it. The writing can then be done on the beeswax, with any sharp instrument, and the lines and marks thus made should be painted with a fine brush dipped in a liquid made of one ounce of nitric acid and one-sixth of an ounce of muriatic acid. When the written lines are filled with this liquid, it should be allowed to remain five minutes, and then the article should be dipped in water and afterward cleaned.

Aluminum Foil.

Beaten aluminum leaf may now be obtained in books like silver leaf, and is largely used instead of silver for decorative purposes. Mr. Levison suggest heavy aluminum leaf as a substitute for tin foil for coating Leyden jars, and similar electrical apparatus. Area for area, it does not cost much more, is much lighter, and permanently retains its polish. A book of fifty leaves of aluminum, of the ordinary thickness, costs twenty-five cents; of a thickness suitable for Leyden jars, fifty leaves, about four inches square, costs $1.00.

A FLEXIBLE LADDER FIRE ESCAPE.

Two pieces of canvas, or a single folded piece, are stitched transversely to form pockets to receive cross bars. The canvas is then stitched along its side edges to form passages for the side ropes. Near the sides are formed hand openings, and just over the cross bars in the center are foot openings. Along both sides of the ladder are placed ropes, which are secured to the canvas by stitching, and to the bars by rivets or staples. When the ladder is to be used as a fire escape, one end is attached to a cross bar of wood or iron, having slots made in it to receive hooks secured to the casing of the window. For further security, hooks or grapnels may be secured to the ends of the ladder for anchoring the lower end to the ground, and for attaching the upper end to any convenient object within the room. The ladder is to be secured on the inside of the window at the top of the lower sash, so that persons can step upon it from the window sill and descend on the inner side to the ground. It is made in sections, in order that any desired length can be obtained. Constructed in this manner the ladder is cheap and strong, and, being flexible, can be rolled up so as to occupy but little space, while it can be quickly adjusted when needed as a fire escape.

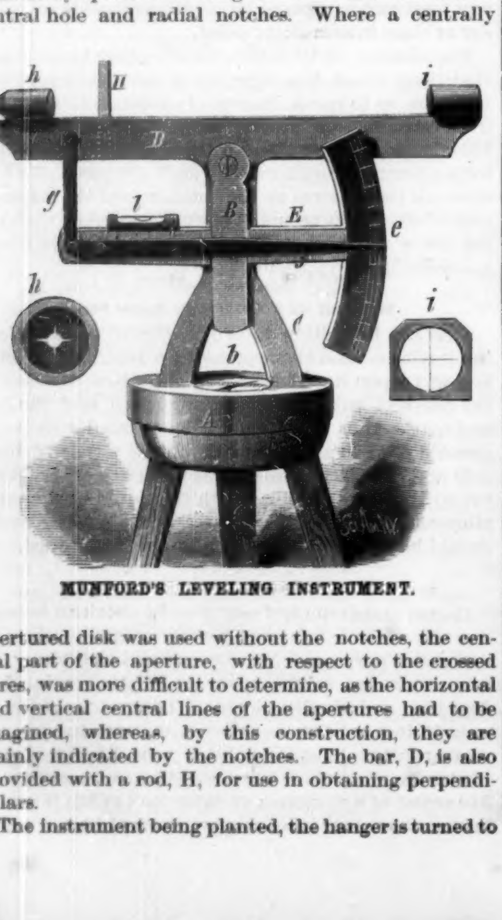


WRIGHT'S FLEXIBLE LADDER FIRE ESCAPE.

This invention has been patented by Mr. Edward P. Wright, of Portland, Oregon.

LEVELING INSTRUMENT.

In a recess in the base, A, which is pivoted upon the top of the tripod, is fitted a compass for use in obtaining right angles. Attached to the base is the standard, C, pivoted to one side of which is the bar, D. Mortised into the bar is the hanger, B, held by the same pivot screw that secures the bar to the standard, so that both parts can swing independently. The bar, E, is attached to the hanger so as to form side arms, one of which carries a scale bar, *e*, while to the other end is pivoted a pointer, *f*, that is connected by a link, *g*, to the top bar. This bar carries front and rear sight tubes, *h i*, the latter of which is fitted with crossed wires, and the former with an eye piece consisting of a disk of metal with a central hole and radial notches. Where a centrally apertured disk was used without the notches, the central part of the aperture, with respect to the crossed wires, was more difficult to determine, as the horizontal and vertical central lines of the apertures had to be imagined, whereas, by this construction, they are plainly indicated by the notches. The bar, D, is also provided with a rod, H, for use in obtaining perpendiculars.



MUNFORD'S LEVELING INSTRUMENT.

The instrument being planted, the hanger is turned to level the bar, E, which is determined by placing a pocket level on the bar, as shown at *l*. The end of the pointer, *f*, is then brought to the zero point on the scale and the bar, D, thus moved to the level. If a line is to be run with a rise or fall, the pointer will be correspondingly adjusted to the scale, which, being properly proportioned to the adjustable parts of the instrument, may also be used for measuring altitudes and distances.

This invention has been patented by Mr. Wm. H. Munford, of Anna, Ohio.

Scale Hardness of Metals.

The following is a scale of hardness in use in the laboratory of the Technical High School at Prague, composed of eighteen metallic substances, arranged in ascending order from the softest to the hardest:

1. Pure soft lead. 2. Pure tin. 3. Pure hard lead. 4. Pure annealed copper. 5. Cast fine copper. 6 Soft bearing metal (copper, 85, tin, 10; zinc, 5). 7. Cast iron (annealed). 8. Fibrous wrought iron. 9. Fine grained light gray cast iron. 10 Strengthened cast iron (melted with 10 per cent of wrought turnings. 11 Soft ingot iron, with 0·15 per cent carbon (will not harden). 12. Steel, with 0·45 per cent carbon (not hardened). 13. Steel, with 0·96 per cent carbon (not hardened). 14. Crucible cast steel, hardened and tempered, blue. 15. Crucible steel, hardened and tempered, violet to orange yellow. 16. Crucible steel, hardened and tempered, straw yellow. 17. Hard bearing metal (copper, 83; zinc, 17). 18. Crucible steel, glass hard.

The test is made by drawing a cylindrical piece with a conical point along a polished surface of the metal to be tested. In the case described, that of a bronze used for the cross head guide of a locomotive, the point, when loaded with five kilogrammes, was drawn six times through a distance of three centimeters. Under these conditions the points of the number below five in the scale were blunted without marking the surface; with Nos. 5 and 6 neither point nor surface was abraded; but No. 7, while being slightly worn on the point, began to scratch the surface. The hardness was, therefore, that of pure copper or soft bronze. The absolute tensile resistance was found to be 2,051·7 kilogrammes per square centimeter, while that of copper is 1,920 kilogrammes per square centimeter, and that of the bronze, No. 6, is 2,300 per square centimeter, thus showing an intimate relation between the strength and hardness of similar metallic compounds.

The Pneumatic Postal System of Paris.

The pneumatic system in Paris has recently been extended to the suburbs, and a very important service will shortly be opened by the postal authorities. This system has cost upward of a million francs for the laying of the pipes and the erection of the appliances. The longest distance between any two points in the system is 11,000 meters (about seven miles), and the uniform charge has been fixed at three pence for the delivery of a letter within one hour after its receipt. Compared with either the London postal or telegraph system, the facilities thus placed within the reach of Parisians are far greater.

GRAVITY FRICTION CLUTCH.

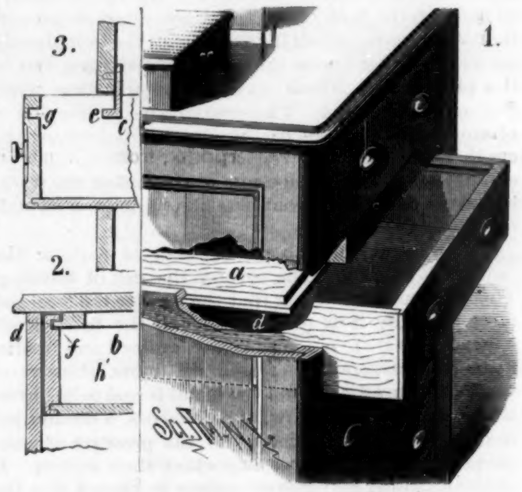
The object of the invention recently patented, herewith illustrated, is to provide a clutch for a mowing machine—or any other machine requiring a clutch—that will be noiseless and will take up all lost motion, in order that the knives may begin to operate the instant the wheels move, thus preventing the machine from clogging or leaving any grass standing. It is also designed for use upon horse rakes, sewing machines, etc.; when used upon the former, it causes both wheels to begin working at the same time, thereby obviating the jerking of the shafts against the horse, as in the case with a pawl-and-ratchet device. The disk, C, is recessed inside, and has a hub formed with a set screw, by means of which it may be rigidly secured to the shaft. The disk, B, is formed with a cam, B', upon its inner face. Neatly but loosely fitting the recessed inside of the disk are the disk segments, E. When the disk, C, is revolved in the direction of the arrow, the eccentric hub, B', binds against the segments, E, and the loose disk, B, is revolved in the same direction. When the disk, C, is moved in the opposite direction, the segments will not bind, but be carried around in the disk.

Figs. 3 and 4 show the same idea differently carried out. The circular plate is provided with a triangular-shaped hub formed of three eccentric arcs and three tangents, the latter meeting the arcs at the centers of the sides of the triangle. The recessed disk carries three disk segments, which bind against the triangular hub when revolved in one direction, and which are carried around when the direction of revolution is reversed. These clutches will not exceed in expense the ordinary pawl-and-ratchet, and are durable and effective in operation.

Additional particulars may be obtained by addressing the inventor, Mr. Anson D. Simpson, of Niverville, N. Y.

DUST COVER FOR DRAWERS.

The covers, *a*, *c*, are made to wholly or partly close the top of the drawers by tongues, *d*, *e*, on which corresponding groves, *f*, *g*, of the box sides and front ends will close when the drawers are shoved back into their cases, the covers being attached to the cases so as to remain stationary when the drawers are moved. The covers may close the whole of the drawers, as shown in Fig. 1, or only close with the front end, as in Fig. 3 The latter device may be easily attached to the front board of drawers in use, and is a simple angle strip having the tongue, *e*, suspended suitably for closing in the groove, *g*, which may be readily made in the front end of the drawer. These covers may be solid boards of the whole width of the drawer, or they may consist of a frame, Fig. 2, which will, when attached to the case, serve the same purpose, and as well as if solid. Constructed in this manner the drawers of a bureau, desk, or counter may be tightly closed so as to exclude the dust.

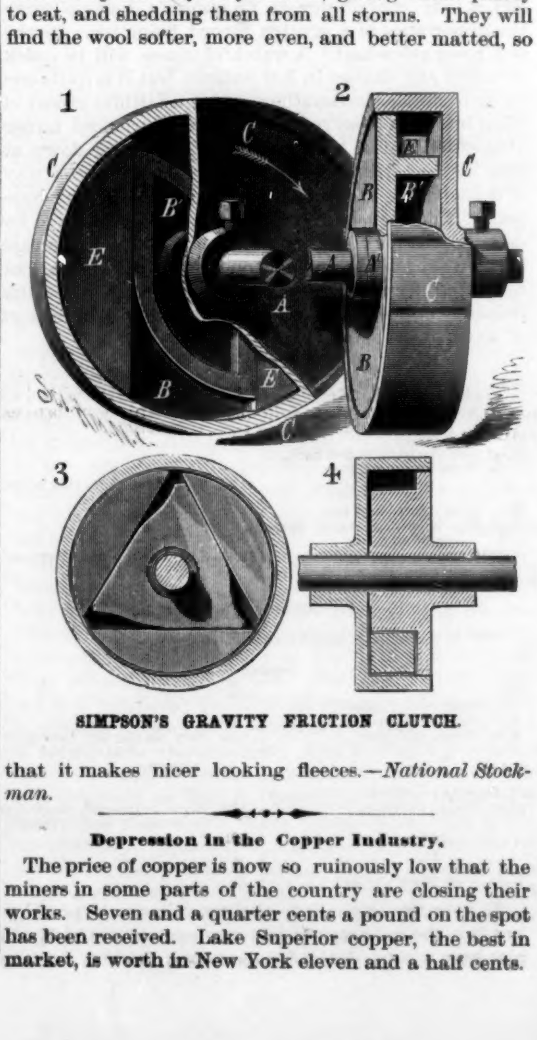


HAMILTON'S DUST COVERS FOR DRAWERS.

This invention has been patented by Mr. Alfred J. Hamilton, of Beaverton, Oregon.

Good Wool.

The production of a first class fleece of wool cannot be accomplished by a novice. It requires, in the first place, a well bred sheep, and then care in feeding and handling through all the stages of growth, and very great care in handling the fleece after it leaves the sheep's back. No matter how well bred a sheep may be, nor how good a fleece it naturally has, unless it is properly treated, its wool will be unmerchantable. Many think it does not matter how the sheep is kept, the fleece will grow just the same, and be as nice as the fleece on a well fed and shedded animal. It would be well for these men if they would compare their clip of wool with those of some of their neighbors who treat their sheep the way they should, giving them plenty to eat, and shedding them from all storms. They will find the wool softer, more even, and better matted, so that it makes nicer looking fleeces.—*National Stockman.*



SIMPSON'S GRAVITY FRICTION CLUTCH.

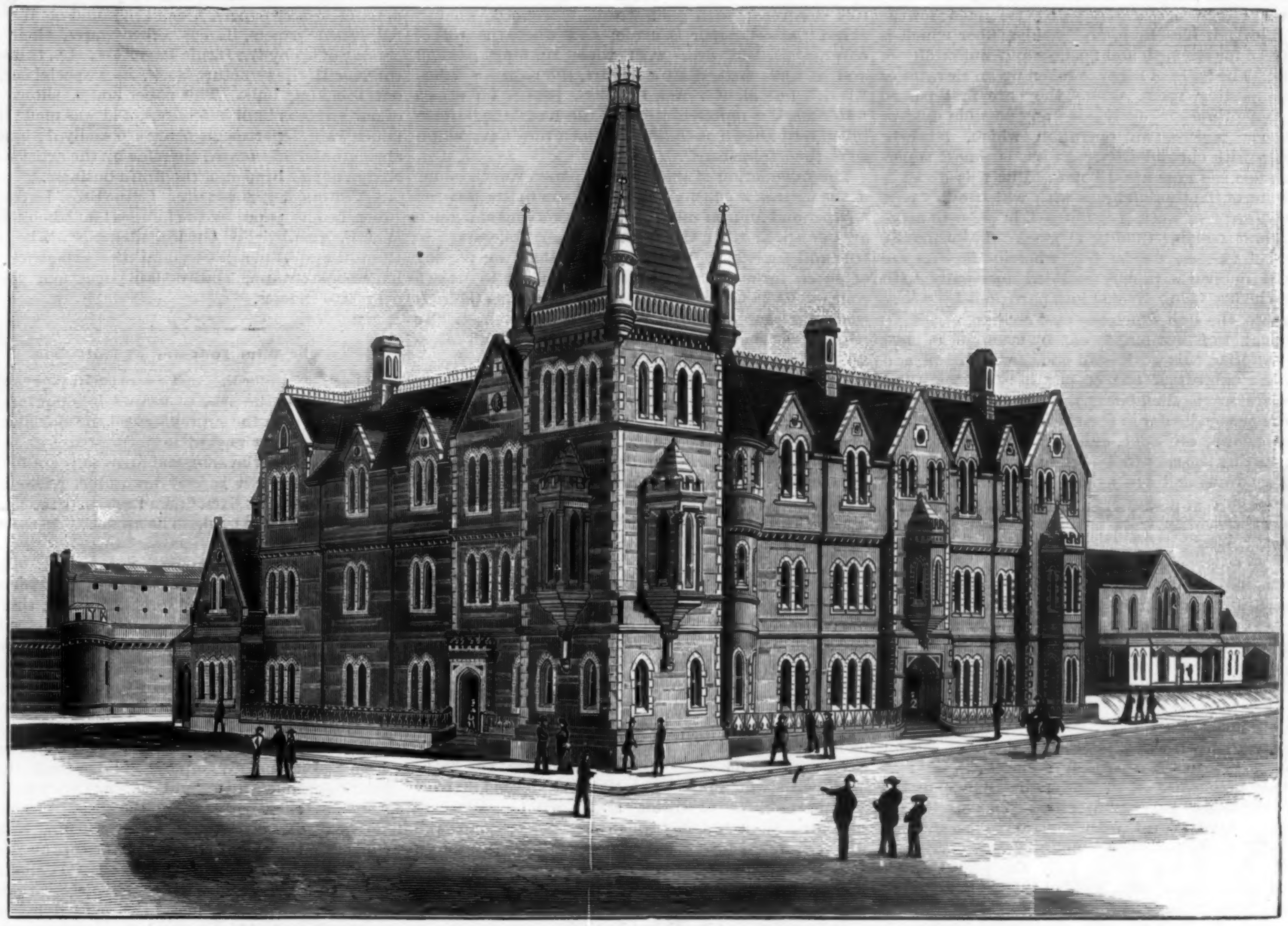
Depression in the Copper Industry.

The price of copper is now so ruinously low that the miners in some parts of the country are closing their works. Seven and a quarter cents a pound on the spot has been received. Lake Superior copper, the best in market, is worth in New York eleven and a half cents.

A "WORKINGMAN'S" COLLEGE, MELBOURNE.

The accompanying illustration represents one of many endowed institutions with which the young city of Melbourne, Australia, is liberally supplied. The city had grown from a population of 25,000 in 1851 to 300,000 in 1881, and with this rapid growth many great fortunes were made, principally in gold mining, wool growing, and land speculations, and many of those thus suddenly acquiring wealth have expended it with a free hand in beautifying their principal city and the founding of educational institutions. The "Workingman's" College herewith shown is free to all, instruction being given therein to all applicants, both day and evening, in practical mechanical work of a wide variety, mechanical drawing, mathematics, and all those branches which will aid an industrious and determined workman to rise in his calling. It is one of those practical institutions everywhere needed, but likely to be especially useful in a new and rapidly growing country, where the adventurous and enterprising from all quarters of the world are attracted in unusual numbers.

Melbourne is built on numerous gentle hills, which show off to advantage its many fine public buildings. The streets are all 99 feet wide, and the parks, squares, and gardens are so numerous that with only one-thirteenth the population of the city of London it occupies nearly half as great an area. The Melbourne University is a picturesque mass of buildings, behind which is the National Museum, freely open to the people, as are all public places in Melbourne. There are in Melbourne, among its numerous state schools, about thirty whose size and proportion entitle them to rank with the architectural ornaments of the city. It is said there is no city where more has been done for the working classes, or where they have made so good a use of their adventages, about three out of every four mechanics who have reached middle life owning the cottages they occupy.



WORKINGMAN'S COLLEGE, LATROBE STREET, MELBOURNE, AUSTRALIA.

Steel Rails in the United States.

The productive capacity of the steel rail mills of the United States is about 1,600,000 tons per annum. About 600,000 tons went into new lines last year, and the amount used as renewals, new second track, and siding is estimated at 650,000 tons, or 5·42 per cent of the total amount of rails in track. This rate is equivalent to a renewal of the lines once in 18·4 years. At the end of 1883, a little more than half the track of the United States was iron. The consumption of rails for maintenance ran down from 10·30 per cent in 1872, when steel rails were first used, to 5·92 per cent in 1877; then rose again to 11·16 per cent in 1881, and receded again to 5·42 per cent in 1883. The production of steel rails increased from 83,391 tons in 1872 to 1,304,393 tons in 1882.

The Bellevernon Gas Well.

The Bellevernon (Pa.) gas well is now nearly 2,800 feet deep, and drilling ceased. At about 200 feet, a 3 foot vein of coal was struck, and was the only coal found. At 400 feet a pretty strong vein of salt water; and at 600 feet another vein of salt water. At 1,950 a vein of gas was found in what appeared to be a compact rock formation. The gas not being as large in volume as desired, the drill was sunk to the present depth of nearly 2,800 feet, and no more gas being found the well was torpedoed at the gas vein, first with 40 quarts of nitro-glycerine, and then with a hundred quart torpedo, enough to turn the well inside out. This increased the flow of gas, and it is thought there is sufficient now to heat a 10 pot furnace.

New Alcoholic Ferment.

At Busalla, in the north of Italy, there is a small brewery which has gained a considerable reputation for its beers brewed on the low fermentation system. Last season these beers were very inferior, and without any apparent reason. A local chemist, M. Mendes, was called in to investigate the matter, and the result of his researches was the discovery of what is believed to be a new form of ferment. Among the cells of ordinary Saccharomyces cerevisiæ were some of Saccharomyces Pastorianus, and some other cells very much smaller in size; these latter were isolated and cultivated by themselves, and were then found to be almost spherical in shape, and from 1-300 to 1-500 of a millimeter in diameter. The shape, size, and general appearance of the cells of this ferment were found to be very constant, and they very closely resembled those represented on the right hand of the plate iii. in Pasteur's "Etudes de la Biere." So far there would be nothing very remarkable in the identification of a new form of ferment, but M. Mendes by some carefully conducted experiments has proved that this ferment is altogether without action on cane sugar. It is generally admitted that ordinary yeast is not capable of directly fermenting cane sugar, but that it first exerts an inversive action on cane sugar, and after this inversion fermentation takes place. Now the peculiarity of the new ferment discovered by M. Mendes is not that it will not ferment cane sugar, but that it will not invert it. Experiments were made with this new ferment on impure cane sugar solutions, and the result was said to be that the glucose and invert sugar was fermented by it, but the cane sugar was left untouched. The practical importance of this discovery to sugar refiners must therefore be very great, and it is at the same time of very considerable interest to brewers. We propose to refer to it in greater detail on a future occasion.

A Wonderful Grotto.

A correspondent in Cagliari writes to the *Avenire di Sardegna* the following description of the stalactite grotto discovered not long ago at Dorgali, in Sardinia, which is approached by a difficult and tortuous path leading down into a gloomy ravine on the mountainous coast: "The grotto commences by an ample space, the vault of which is supported on columns. On the rocky ground may be seen the print of a human foot. From this place you enter a vast hall of such magnificence that it extorts an exclamation of wonder. Sixteen columns with varicolored capitals rise from the marble floor and sustain a pure white roof, from which depend the figures of birds, guns, serpents, baskets of fruit, and a thousand other tricks of nature. But the most striking object is an altar ornamented with enormous baskets of colored flowers, and on which are large candelabra and a shrine so exactly imitated that you are tempted to try to open it in order to see the chalice within. From the roof above hang festoons of flowers, which reach down almost to the altar as if attempting to conceal it. The most wonderful thing in the hall was, however, the petrified skeleton of a majestic stag, which was partly destroyed by visitors, and the spine of which has been sent entire to a professor of natural history in Cagliari. The grotto contains six other large chambers, decorated with arabesques in stalactite, and full of pillars, human figures, opaque mirrors, and other wonderful imitations of objects of art and nature."

Cab and Hack Indicator.

Ackerman's *Gewerbe Zeitung* gives a description of a new apparatus for cabs, hacks, gurneys, etc., to register the amount of time each person hiring the vehicle retained it and paid for, thus preventing the possibility of fraud on the part of the driver. Most of these registering apparatus are too complicated and expensive for general use, but this objection does not apply to this new invention. It consists of a clock movement with index and dial beneath each seat in the cab. The movement is inclosed in a box to protect it from dust, and when the cushion is lifted up, a small cover over the dial is seen; this cover locks down, and only the owner of the cab line keeps the key. Lifting this cover, the register can be read at a glance. The cushion is so arranged that the weight of a person seated upon it presses a lever in the clock works and sets the train in motion, while the weight of any ordinary article of baggage is not sufficient to accomplish this. The train keeps in motion as long as the seat is occupied, but stops short when the customer quits the vehicle. By this means the proprietor is able to inspect this automatic register of the number of hours and minutes the vehicle has been employed in transporting passengers.

AMERICAN INDUSTRIES.—No. 93.

THE MANUFACTURE OF LINEN PAPERS AND PAPER WARES.

CRANE BROTHERS, of Westfield, Mass., whose factory forms the subject of our first page illustrations, make a specialty of producing the finest linen and record papers known to the trade. Their trade-mark of a crane in the water-mark, in different positions for different sizes of paper, is everywhere recognized among buyers of first-class goods as a guarantee of the best material and the most thorough manufacture.

These papers have stood the test of competition at three World's Fairs—Philadelphia, Paris, and Melbourne—and everywhere have received the highest awards.

The variety of materials of which paper is made is almost numberless, and new ones are constantly being introduced, but in the establishment of Crane Brothers only the old-fashioned stock, cotton and linen rags, is used, and these are all new. They are the cuttings of shirt and collar manufacturers, sail makers, etc., which have to undergo comparatively little treatment for the most thorough bleaching, and yield a fiber which is unexcelled for strength and fineness and uniformity of texture. The bales of rags are taken up an elevator to a large sorting room, where they are first passed through a "thrasher" to remove any possible dust or extraneous matter, an operation which, however necessary with old and dirty rags, seems almost superfluous when the rags are all new. But this detail is significant of the thoroughness with which every part of the subsequent work is conducted, in order to make the highest possible quality of stock. This thrasher consists of a closed wooden box, wherein the rags are revolved in drums thickly studded internally with spikes, the box being divided into partitions by coarse wire gauze, through which the dust escapes.

Although rags are largely cut by machine in most paper factories, this work is all done here by hand, and forms the subject of one of our illustrations. The knives are scythe-like, being fixed at a little incline from the perpendicular in the tables at which the sorting and cutting are done, and before which the girls stand, cutting the rags to average about three inches in size by drawing them against the curved blades. This hand-cutting also affords the opportunity of making a most thorough assortment and classification of the stock. After cutting, the rags are passed through a duster in order to complete the removal of any possible remaining dust and dirt, and then again submitted to a final inspection by a separate set of hands.

The next process is the boiling of the rags with alkalies—lime, soda ash, or caustic soda and water being used for this purpose—by which all dirt and grease are removed, as well as coloring and glutinous matters, etc. Sometimes only the lime solution is used, and in other cases only lime and soda ash.

After the boiling, which occupies a longer or shorter time according to the condition of the stock, the rags are ready for treatment in the engine shown in the view of the ledger paper pulp room. This machine is an oblong kind of vat, with rounded ends, divided lengthwise in its center by a midfeather. There is a constant flow of fresh water, only the purest water that can be obtained being used in this as in all other processes of their paper making. On one side of the midfeather is an inclined plane on the bottom of the vat, leading up to the bottom of the dip of a revolving roll, whose circumference carries steel-faced blades; the bottom of the vat so conforms to the space in which the roll revolves that the rags, passing in with the water, are carried partly around the roll against other knives in the bottom, and dropped on the other side of the roll, to be then carried around the end and through the other side of the vat until they come again to the roll, which washes, rubs, and disintegrates the fiber. After the rags have been submitted to this process for a time, the roll is so lowered that its blades reduce the stock to finer fibers than would be effected in its first position, different kinds of stock requiring different treatment, but it being indispensable, in their papers, that the pulp should be fine and even. The bleaching agent, usually a solution of the ordinary bleaching powder of commerce, is applied when the stock is in the condition of half stuff in the washing engine, and very soon gives the contents of the vat the appearance of snowy whiteness.

The beating engine, which succeeds the washer, operates on the same principle, but runs faster and has knives which are not so blunt. The treatment of pulp in the engine differs according to the kind of paper to be made, fine writing paper requiring from fifteen to twenty-four hours' work, while the engine is run two and sometimes three days and nights when the fibers must be fine and long, as on strong bond, ledger, and bank-note papers.

The stock once prepared is drawn into an enormous stuff chest, which occupies a separate building adjoining the room in which is the large Fourdrinier machine shown in one of our views, where the operator is seen holding a sheet to the light to make sure of the proper adjustment of the water-mark. It is a special feature of the Crane Brothers' paper that care is always taken to have the water-mark come in the same place on each sheet.

The Fourdrinier machine has been so often described that it is hardly necessary to more than refer to it here, though it always occupies the most conspicuous place in the machinery of a paper manufactory. The pulp is fed into a regulating box, where any excess over what is required is taken by an overflow and reconveyed to the stuff chest. Special appliances are attached to the machine in this factory to guard against any lumps in the pulp being fed to the machine. The pulp after passing over sand tables and strainers is led to an endless cloth of very fine wire, which, besides the forward motion, is moved from side to side to interweave the fibers; thence it passes to an endless felt and between press rolls to take out the water and knit the fiber, guide bands or deckles at the side controlling the width. The water-mark is fixed by what is called the dandy roll, very near the end of the machine, where letters or figures of any desired design are fixed upon the paper in the soft web by a wire cylinder. When the dandy roll is covered with plain woven wire-cloth, what is called "wove" paper is made; and when the roll is covered or laid over with wires running parallel and at some little distance apart, the paper is called "laid;" but all of Crane Brothers' papers have as a water-mark a representation of the long-legged, long-billed bird known as the crane, which they have adopted as their trade-mark.

The calendering of linen record paper, shown in one of the figures, is effected by passing the sheets between a paper and an iron roll, the latter revolving at a much greater speed than the former. These rollers are so true and are held so closely together that the passing of sheets through them causes the rollers to make a continuous noise of vigorous hammering, as the rolls come together after the passage of each sheet. By passing the sheets through several times, a high calender or glaze is effected.

The plating of "Warranted All Linen" paper, forming the subject of one of our views, is effected by applying heavy pressure to sheets placed between polished plates of copper or zinc. The metallic plates and the sheets of paper are made into bundles, and the whole passed between two strong rollers, heavy pressure being communicated to them by means of screws or levers and weights applied to the ends of the top roller. This makes a dead, hard finish, without the polish of calendered paper.

The main mill, shown in one of the pictures, is 100 by 54 feet in size, and has six engines. The machine room forms an addition, 88 feet long. The rag room and stock house are in an entirely separate building, 80 by 34 feet. Although the mill has a most excellent water power, this sometimes fails, and an engine of 185 horse power is also used. The necessity of a large supply of pure water is always to be considered in any choice of site for a paper mill, and this is especially the case where goods of so superior a quality are to be made. A six inch pipe conducts water to the mill from a remarkably clear spring about a mile away, and the firm have recently put down an artesian well which promises to yield a never-failing supply of equally good quality. All the water going into their pulp is also passed through an admirable system of filters.

Although Crane Brothers do not themselves furnish papers for stationers in ordinary letter and note form, they have an arrangement with the Birnie Paper Co., of Springfield, Mass., whereby the latter, taking their Warranted All Linen paper in the large sheet, made for the sizes required, with special water marks, prepare the goods and make the envelopes for the stationery trade. The favorite mark on these papers is the crane, without any words or other sign, the different positions of the crane showing the different sizes.

The linen fiber mill shown is a distinct building, in which is conducted an entirely separate and very different business from the paper manufacture. Here are made articles in appearance very much like Japan lacquer work, but of great strength, as they are all of the best linen fiber. It is an industry unique in itself, embracing the production of articles to take the place of almost everything used in the way of basket work for the house, the office, or the factory. The list includes a great variety of trays, knife and fork receptacles, and substitutes for all kinds of basket work for house and office use; some of these substitutes for baskets being made of a size to equal large dry goods boxes. The latter are mainly to be used in factories or warehouses where they can be rolled around on wheels, as they are about as light as ordinary baskets of such size, but of far greater strength and endurance. Fire buckets which have lasted for years have been turned out of this department.

The putting of the fiber into shape for the manufacture of these paper wares requires a machine of very different character from that used in the paper factory. It is what is known as a cylinder machine, in which the linen pulp, after it passes the strainer, enters a vat, in the center of which revolves a large drum or cylinder, covered with fine wire cloth. As this revolves, the fibers attach themselves to the wire and the water passes through the meshes, the latter being assisted by means of a pump, the sheet being allowed to wind around a press roll until it has acquired the right thickness, according as a larger or smaller article is to be made therewith. In making the large baskets the sides are fitted around a pattern or former, when the bottom is put on and the whole subjected to a powerful pressure, which drives out most of the water and firmly unites the parts. After they are partially dried they are soaked in linseed oil, receive a coat of japan, then go into drying ovens, steam-heated; this is sometimes repeated two or three times, when they go to the painter's, the process being not dissimilar to many other kinds of japanning, although the degree of heat is not so high, and there are many technical details of importance which the firm have only learned by long experience.

A noticeable feature in the New Orleans Exhibition will be a circular structure, twenty-two feet in diameter, surmounted by the figure of a crane, in which the firm will exhibit a full line of their goods, including a pyramid of Ledger papers, a small pyramid of Warranted All Linen papers, Linen Fiber wares, their boxed goods put up by the Birnie Paper Co., etc., transported there, with the structure itself, in a special car, without breaking bulk. This paper house, shown in one of our views, is built in sections, and was made in their paper ware department, being especially designed and appropriately decorated therefor by the artist who has charge of this branch of the firm's business.

A Visitors' Register made of Crane Bros.' Imperial size Linen Ledger paper by the famous blank book makers, Wm. F. Murphy's Sons, of Philadelphia, will be open for the autographs of sight-seers at the exposition. This huge book contains nearly 2,000 pages and space for over 30,000 names.

The Wine Industry of California.

Notwithstanding the vast increase in vineyards and their products, the price of grapes does not materially decline, nor does the supply exceed the demand. It is estimated that a vineyard in its fourth year will produce two tons to the acre, and in seven years four tons. In the tenth year it is very profitable, reckoning the cost of vineyard at sixty dollars per acre, exclusive of the first cost of the land. The annual expense of cultivation, picking, and handling is about twenty-five dollars per acre. The rapid increase of this branch of industry is something marvelous. In 1848, there were only 200,000 vines in all California. In 1862, there were 9,500,000; in 1881, 64,000,000; and in 1882-83-84, vast numbers of new vines were planted and new vineyards laid out.

The annual yield of wine in California is estimated at about 15,000,000 gallons, nearly one-third of which is made in Los Angeles County. It is interesting to visit the vineyards in the picking season; throngs of Mexicans and Indians are employed in denuding the vines of their luscious burden, and the scene presented would form an excellent subject for the pencil of the artist. The vast wine cellars and great crushing vats give evidence of the extent and importance of this industry. One vat will hold upward of one thousand gallons; piled full of grapes, huge wire wheels are driven round and round in the spurting mass, the juice flying off into troughs on each side, leading into many great vats prepared to receive it. Below, men toil hard working the wheels; loads of grapes, coming up every moment, are emptied into the swirling vat, and the whole atmosphere is redolent of the aroma of richly scented grapes. The cellars where the juice of the grape is stored are quiet, dark, and fragrant; full of great, oval-shaped butts, ten feet in diameter, each containing over two thousand gallons.—*Resources of Cal.*

An International Milling and Baking Exhibition.

A remarkable Milling and Baking Exhibition is proposed to be held next year in Paris. The scheme comprehends every detail of the fitting and organization of the flour mill and bake house, while to round off the whole plan and to provide stalls covered with appetizing and glittering wares, the work of the confectioner and pastry cook has been thrown into the bargain. No pains will be spared to make the exhibition one of the sights of next year's Paris season. The galleries and halls, with their rows of machinery and models, will be largely supplemented by gardens and walks, where the visitor will be able to inspect water and wind mills in full operation, or, as the showman said of his waxworks, "as large as life and more natural." When the idler is tired watching the gyrations of an overshot water wheel, he will be able to saunter through halls full of the bustling life of a great modern factory, to inspect a gradual reduction mill of the most recent type, and to watch the busy movements of bakers hurrying amid all sorts of mysterious machines. This exhibition will be international, that is to say, open to the exhibitors of every country.

To Find the Weight of Silk, Cotton, and Wool in Mixed Fabrics.

Take four samples of the piece of goods to be tested, each weighing 30 grains. Retain one of them for purposes of comparison, and boil the three others for a quarter of an hour in water containing 3 per cent of hydrochloric acid. If the liquid, after this treatment, is strongly colored, renew it, and recommence the operation.

When finished, remove the samples, wash them, and dry them by wringing them in a linen towel. The thickening and sizing are thus removed; so, generally, is the dye of the cotton; that of the wool is less affected; that of the silk is scarcely attacked at all. Dark colored silks are most heavily weighted. If the weight of the salts of iron contained in the tissue is not more than a quarter that of the fiber, they will have been entirely dissolved by the acid solution, and the silk will assume a clear maroon tint. If the stuff was more heavily weighted, it will have been but partially discolored. In this case remove some of the fibers, dry them at 105° C., weigh, transfer to a piece of platinum foil, and calcine. If the weight of the ash exceeds 5 per cent of that of the fiber, note it, and put one of the samples aside. Put the two others for two minutes in a solution of basic chloride of zinc at 60° B.

This chloride is prepared by mixing:

Fused chloride zinc	1000 parts.
Distilled water	850 "
Oxide zinc	40 "

Heat the mixture until the oxide of zinc is dissolved.

Upon lifting the samples from the above solution, let them drain; then wash them in acidulated water, and afterward in pure water. Hasten the operation after each immersion by wringing the samples in linen cloth. The silk will be found to have been entirely dissolved.

One of the two samples, now containing no more silk, is set aside. The other is submitted for a quarter of an hour to a gentle ebullition in from 9 to 10 cubic inches of a 5 per cent solution of caustic soda. If the boiling is too rapid, or the solution too concentrated, the vegetable fiber will be attacked. The sample is washed as before, avoiding all rubbing, the fibers having lost their solidity through the treatment to which they have been subjected.

The four samples are then heated for a quarter of an hour in distilled water, wrung, and dried in the air; on the following day they are weighed. The first piece should weigh 30 grains.

The excess of the weight of the first sample over that of the second gives the thickening and sizing. The excess of the second over the third is the weight of the silk. The weight of the fourth will be the total of the vegetable fibers contained in the tissue, but the number found will always be a little too light, the solution of soda having slightly attacked the fiber. For cotton the loss sometimes equals 5 per cent.

We have only to multiply the numbers obtained by 50 to get the percentage of thickening and sizing, of silk, and of vegetable fiber contained in the fabric; the remaining per cent represents the proportion of wool.

Aquamarine.

Aquamarine, says Mr. Edwin W. Streeter, partakes of the nature of the emerald and the beryl, both of which are varieties of the same species, but the aquamarine contains oxide of iron in the place of the oxide of chromium. Its hardness being less than that of first class stones—7·5 to 8—detracts from its value in the jeweler's estimation.

Most of the aquamarine comes to us from Brazil, already cut; but the stones are found elsewhere, viz., in the granite regions in Siberia, in the Ural Mountains, and in the Altai Mountains. Formerly they were obtained from the frontiers of China.

The varieties known as beryl are discovered in Siberia, in the granite district of Nertschuisk. They occur at times as prismatic crystals of twelve inches in length. But at Dauria, in the mountains of Odon Tchelon, there exist at different elevations, in a mass of decomposed granite, crystals of beryl of a green tint, varying toward a warm yellow, rarely exceeding an inch in length. At a higher range there is a vein of micaceous clay of purer green and of greater size. At the summit the gem is of a different hue, remarkably transparent, and presenting the blue tint of some valuable sapphires. In the United States, France, Bavaria, Saxony, and Bohemia this stone is found.

Its chemical composition is more varied than that of the majority of this class of gems:

Silca	66·45
Alumina	16·75
Glucina	15·50
Oxide of iron	0·60
Loss	0·70
	100·00

This gem is a great favorite with the English, chiefly because it possesses the advantage of retaining its luster in artificial light. Jewelers distinguish the varieties of this stone in a manner peculiar to themselves, viz., the green and blue varieties they call aquamarine, while the yellow variety receives the name of beryl. But the former is again subdivided into (1) aquamarine, pure, light sky blue; (2) Siberian aquamarine, light greenish blue, bright luster, and faintly colored; (3) aquamarine chrysolite, greenish yellow, sometimes yellowish green, with bright luster.

One of the finest specimens of aquamarine is the remarkable sword hilt from the collection of the late Mr. Hope. It is beautiful in color, and perfectly pure. It is covered with facets, and is unique both as a mineral and as an example of the lapidary's art. It is said to have belonged to Prince Murat.

In the same collection is an aquamarine engraved to represent a female holding a bagpipe; a light drapery floats around the upper part of the body.

Aquamarine is made into a variety of ornaments. It is said that the Emperor Commodus possessed a Hercules engraved on aquamarine by Hyllus; and that in the treasures of Odeocalchi there was a stone engraved by Quintilius, representing Neptune drawn by sea horses. In the National Library in Paris there is a beautiful engraving of the head of Julia, the daughter of Titus, by Evodus, on aquamarine. An aquamarine $2\frac{1}{16}$ inches long and $2\frac{3}{8}$ in thickness adorned the tiara of Pope Julius II.

Pasteur's System of Brewing.

In the course of an interesting paper on "The International Health Exhibition," lately read before the Society of Arts, Mr. Ernest Hart drew special attention to Pasteur's researches on beer, and gave the following concise *resume* of this great investigator's suggestions for brewing sound beer. After having demonstrated that brewers employ, generally, a ferment containing, among others, injurious germs, M. Pasteur indicates the following means for obtaining a pure ferment. A small quantity of pure yeast is prepared according to the exact rules of the laboratory. This is introduced into a large copper pan, three-quarters filled with the wort of beer, which has been first carried to the boiling point, and then cooled before the introduction of the yeast. This vessel only communicates with the external air by a long tube of copper, many times bent in such a way as to permit the gases to escape without external germs being able to enter. When the wort has been developed, it is drawn off by a tap placed in the lower part of the apparatus, and which is previously purified with the flame of a spirit lamp. The wort of the beer is put to ferment in a large white metal vat, resting on a plank, and closed by a movable cover, this movable lid dropping into a groove which is kept full of water. As the wort arrives in a boiling state in this vessel, it destroys any germs which may exist there. When it is cooled, and the cooling may be rapidly aided by the use of external cooling water, the yeast is introduced through an opening in the lid. The aeration of the fluid is obtained by two tubes curved downward, by one of which carbonic acid escapes, and by the other the air enters, after being previously filtered through a layer of cotton wool rolled round a cylindrical cage on metal wires which cap the extremity by which the air enters. This apparatus, like the foregoing one, reproduces exactly the conditions which are found to be necessary in the laboratory to prevent the introduction of external germs. The aeration by these two tubes is sufficient, for the carbonic oxide being heavier than air, they are placed in such a way as to form a siphon; moreover, during the fermentation, the wort is certainly kept in movement by the ebullition of the gas which escapes, so that the aeration, although less active than in some of the technical apparatus previously in use by brewers, is more than sufficient. By employing this procedure, secondary fermentations are no longer to be feared, and the spoiling of beer by secondary fermentation is almost entirely put an end to.

Krupp Essen Works.

The following statistics of Krupp's establishment at Essen are of interest. In 1860 Herr Krupp's factory at Essen employed 1,764 hands; in 1870 the number of workmen had risen to 7,084, and the present number is about 20,000. Including the wives and children of the employed, we have 65,381 souls depending for their subsistence on Krupp's works, 20,000 of these inhabiting houses belonging to Herr Krupp. The whole establishment comprises altogether eight sections: 1. The factories at Essen. 2. Three coal mines at Essen and Bochum. 3. Five hundred and forty-seven iron mines in Germany. 4. Several iron mines in the north of Spain, in the environs of Bilbao. 5. The blast furnaces. 6. A range at Meppen, 17 kilometers in length, for gunnery experiments. 7. Other smaller ranges. 8. Four steamers for marine transport. The number of blast furnaces in use is 11, of other furnaces 1,542. There are 439 steam boilers, 82 steam hammers, and 450 steam engines, 185,000 horse power altogether. At Essen alone the works are fitted with 59 kilometers of rails, 28 locomotives, 883 wagons, 69 horses, 191 carts, 65 kilometers of telegraph lines, 35 stations, and 55 Morse apparatus. At present the Krupp works are engaged in manufacturing for the Italian Government a monster gun, which will weigh 130,000 kilogrammes (say 130 tons), and for the transport of which two wagons have been constructed each able to bear a weight of 75,000 kilogrammes.

Expensive Metals.

Following are the names of those metals valued at over $1,000 an avoirdupois pound, the figures given representing the value per pound:

Vanadium.—A white metal discovered in 1830, $10,000.

Rubidium.—An alkaline metal, so called for exhibiting dark red lines in the spectrum analysis, $9,070.

Zirconium.—A metal obtained from the minerals zircon and hyacinth, in the form of a black powder, $7,200.

Lithium.—An alkaline metal; the lightest metal known, $7,000.

Glucinum.—A metal in the form of a grayish black powder, $5,400.

Calcium.—The metallic base of lime, $4,500.

Strontium.—A malleable metal of a yellowish color, $4,200.

Terbium.—Obtained from the mineral gadolinite, found in Sweden, $4,080.

Yttrium.—Discovered in 1828, is of a grayish black color, and its luster perfectly metallic, $4,080.

Erbium.—A metal found associated with yttrium, $3,400.

Cerium.—A metal of high specific gravity, a grayish white color, and a lamellar texture, $3,400.

Didymium.—A metal found associated with cerium, $3,200.

Ruthenium.—Of a gray color, very hard and brittle, extracted from the ores of platinum, $2,400.

Rhodium.—Of a white color and metallic luster, and extremely hard and brittle. It requires the strongest heat that can be produced by a wind furnace for its fusion, $2,300.

Niobium.—Previously named columbium, first discovered in an ore found at New London, Conn., $2,300.

Barium.—The metallic base of baryta, $1,800.

Palladium.—A metal discovered in 1802, and found in very small grains, of a steel gray color, and fibrous structure, $1,400.

Osmium.—A brittle, gray colored metal, found with platinum, $1,300.

Iridium.—Found native as an alloy with osmium in lead gray scales, and is the heaviest of known substances, $1,090.

Fulminate of Mercury.

At Bridgeport, Conn., December 19, a terrific explosion occurred at the works of the Union Metallic Cartridge Company, by which a workman, Peter Burns, aged 40, was instantly killed. The company has three buildings which are used for no other purpose than the manufacture of fulminate of mercury. Each of these buildings has a department sunk below the surface of the ground, and to prevent the demolition of the adjacent buildings in case of an explosion a high embankment of earth surrounds each structure, leaving only the roof visible.

There is no substance so explosive as the fulminate, the slightest jar being sufficient at some stages of its manufacture to cause an explosion; and as a very small quantity will produce great havoc, it is made and conveyed from one building to another in fractions of a pound. Alcohol, mercury, and nitric acid are the ingredients.

The general process is to dissolve the mercury in nitric acid by heat. Alcohol is then poured in, and crystals form. Water is added, and when the fulminate has settled, the acid water is poured off, the residue filtered and washed with water, and dried. This is the compound used in percussion caps and cartridges. It is deposited in the cartridge, and secured in place and rendered waterproof by means of shellac varnish.

There can be only a theory as to how the compound was exploded. It is believed to be due to the carelessness of Burns in dropping a dish. A moment before the explosion William Mackintosh had left the apartment, and when about fifteen feet away, the whole building he had just left was in atoms and in mid air. The embankment prevented disaster from spreading sideways, and the force of the explosion was consequently upward. The shock was severe, glass in adjoining buildings being shattered, and operatives thrown into confusion.

The company, of which Mr. M. Hartley, of New York, is president, is now engaged in filling large foreign orders for cartridges, and every department is filled with busy operatives, hundreds of whom are girls.

Deflection of the Mississippi.

Capt. Eads, who has lately made an inspection of the situation, now declares that within two years the Mississippi is likely to be deflected from its present course past New Orleans down the Atchafalaya directly to the Gulf. Only a tough clay bar across Old River intervenes, and that is being rapidly swept out by the current. The *Times-Democrat* calls earnestly upon Congress to do something immediately to avert the disaster to that metropolis, planting interests of southern Louisiana, as well as the commerce of the great river. That paper asserts that an expenditure of only $12,000 to $15,000 is necessary to obviate the more imminent danger.

THE SUPERGA WIRE ROPE RAILWAY NEAR TURIN.

At a few kilometers from Turin, built upon the summit of a hill which overlooks the valley of the Po, rises the Superga. The events connected with the construction of this basilica have made it, especially since the opening of the wire rope railway that connects it with the foot of the mountain, a frequented place of pilgrimage. The Superga, which was built by Victor Amadeus II., in fulfillment of a vow made to the Madonna during the siege of Turin in 1706, contains the tombs of such princes of the house of Savoy as were not buried at the famous Abbey of Haute Combes. These historic souvenirs, which are still green in the mind of the populace, and, more yet, the splendid view that is to be enjoyed from the summit of the Superga, decided the Italian government and the municipality of Turin to construct the new railway, which has already been baptized by the name of "Italian Righi." The work, which was begun in March, 1883, was rapidly carried on in view of the approaching opening of the general exposition at Turin, and, on the 27th of April, 1884, the new wire cable railway was officially inaugurated.

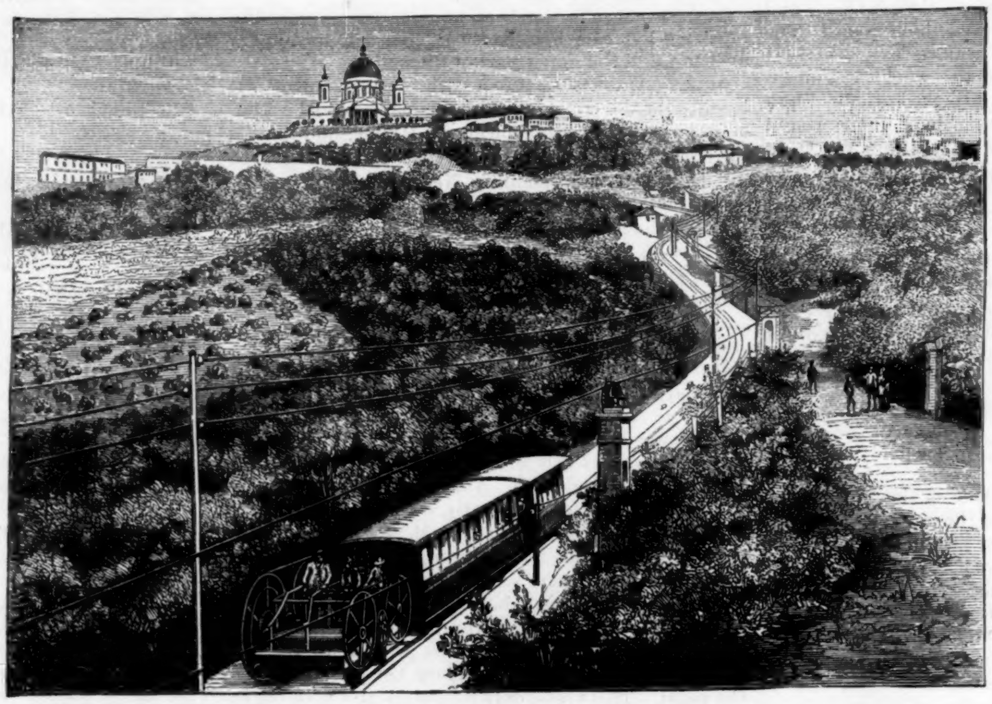


Fig. 1.—GENERAL VIEW OF THE SUPERGA WIRE CABLE RAILWAY.

The system selected for crossing the altitude that separates the basilica (situated at 733 meters above the level of the sea) from the foot of the hill, is that of Engineer Thomas Agudio, already tried with success at Lanslebourg. In this system traction is effected, as well known, by means of a special locomotive, such as is shown in Figs. 1 and 2, and the driving wheels of which are set in motion by an endless cable that traverses, in the double descending and ascending direction, the entire length of the road. The cable, which is set in motion by two stationary steam engines, is guided by intermediate pulleys, either vertical or horizontal, or of varied inclinations, according to the rectilinear direction or curve of the track, which latter consists of two ordinary rails and a toothed central one. The locomotive shoves the car up hill, and holds it back in descending. Such are the well known principles of the Agudio system, to which, after examining in detail the road itself, we shall advert further along, in order to describe the powerful brakes which secure safety to the exploitation.

The cable railway, a general view of which is given in Fig. 1, starts from the foot of the hill, near the village of Sassi, where it connects with the steam tramway running between Turin and Brusasco, travelers being thus able to go directly from Turin to the summit of the Superga without getting out of the car. The total length of the line to the basilica is 3,130 meters, and the difference in level between the starting station and that at the summit is 419. The mean gradient is 12 to 100, and the maximum 20 to 100. The curves, which compose about half the length of the entire road, have a minimum radius of 300 meters. At 733 meters from the Sassi station the road traverses a gallery of 67 meters, and further along another one of 61 meters in length. The other works of art consist of cuttings or of bridges of small importance.

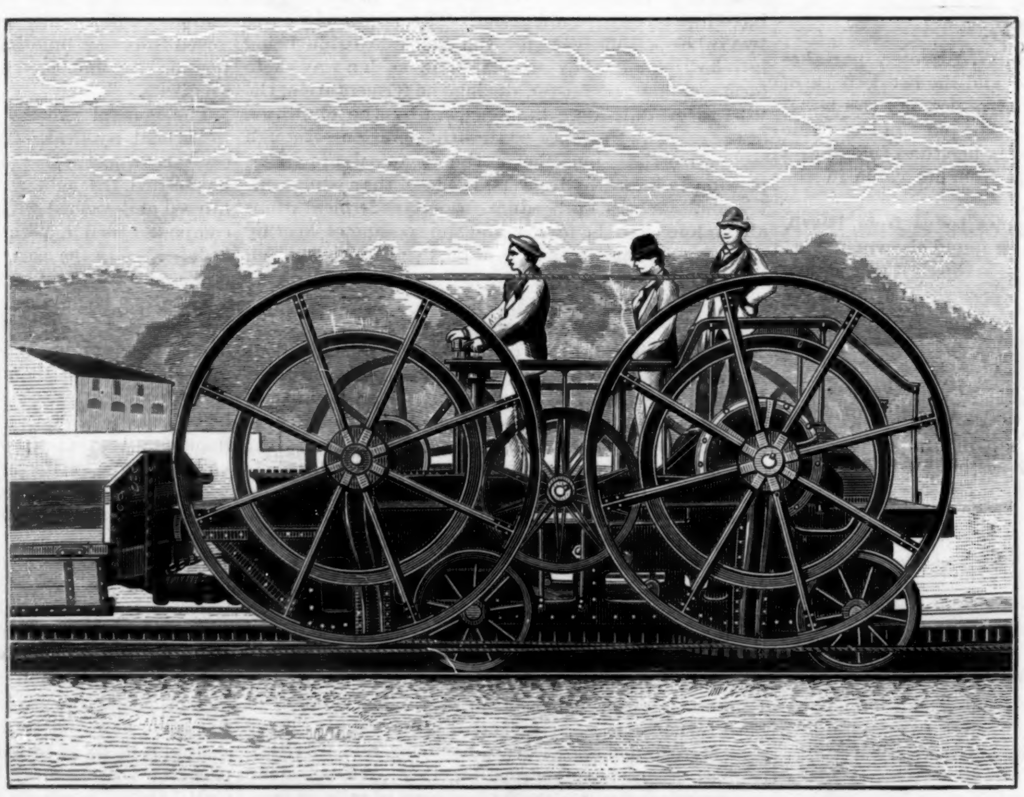


Fig. 2.—DETAILS OF THE LOCOMOTIVE.

The track that supports the locomotive consists of two rails of the Vignoble type (17 kilogrammes per running meter) that are spaced 1·49 m. from axis to axis, and a central rail with double toothing, which Mr. Agudio rightly styles the "vertebral column" of his system. This rail, or rather central conductor, is formed of a steel ribbon, 110 mm. in height and 12 in thickness, bent upon itself in such a way as to present at its sides a double toothing. It weighs 54 kilos per running meter. It is easy to see that the motive cable, which travels with a mean velocity of 12 meters per second, must be supported by a series of pulleys whose form and position vary with the direction of the road. The cable itself is composed of six partial cables, which are themselves formed of 8 steel wires 1·8 mm. in diameter. Its diameter is 23 mm., its weight is 1·5 kilogrammes per running meter, and it is capable of resisting a stress of 140 kilogrammes per square millimeter. During its normal operation it will be submitted to a stress of about 15 kilogrammes only. While the ascending half runs above the track itself, the descending half, which starts from the upper drum, rests upon pulleys mounted upon masonry pillars 4·25 m. beneath the road, and spaced about 100 m. apart.

The general arrangement of the location may be seen in Fig. 2. The transmission of the cable's motion is effected upon the pulleys to the left (in ascending), and these are provided at the circumference with channels in which the cable runs. The motion of these pulleys is transmitted by an intermediate system to a pair of cogwheels, which gear with the toothed central rail, and thus direct the motion of the locomotive. The engineman has within reach brakes of great power, which act by friction upon the driving pulleys or as a grip upon the central rail. In mounting, the grip brake serves to prevent a recoil motion of the locomotive in case of a breakage of the cable. In descending, the friction brakes are used, and, if need be, the others can be applied likewise.

The stationary engines which set in motion the two large drums over which the cable runs, and which consequently move the latter too, are installed at the lower station. They are of the Sulzer type, and develop 500 horse power.

In short, the Superga cable road is classed to-day as one of the most ingenious applications of traction upon steep gradients. Its promoter, and, we might say, its author, M. Agudio, is thus practically carrying out the theories that he has so many times so clearly exposed. Of the panorama which is to popularize this new road, of the superb valley of the Po, the souvenir of which carries one back to the most glorious times of ancient Italy, of the grand aspect of the Alpine chain from Mont Rose to Mont Viso, of all the new wonders that unveil themselves to dazzled eyes, we shall say nothing. Our object is only to give a hasty description of a new work which is henceforth to take its place among the genuine triumphs of engineering science.—*La Nature.*

Pneumatic Clocks in Paris.

Although the grand programme relating to works of public utility in France has been modified considerably of late, and their execution retarded by various causes which would be long to enumerate, there has been no hitch in carrying out that part of the scheme which is concerned with the supply of compressed air for practical uses in the capital. It will be remembered that the original scheme included the working by means of this agency, not only of clocks in the municipal buildings and offices and in private houses, but also of electric lighting and of various motors for commercial purposes.

Of these designs the first mentioned is the only one which has yet been realized to any large extent; but in this, at any rate, namely, the perfecting by the new power a distribution of force to the Parisian clock, rapid progress is being made. Before the end of last year it was announced that no fewer than 6,000 clocks of various kinds, chiefly exposed to public view, were regulated in this way in three of the most populous *arrondissements* of the capital. A short delay will now suffice to establish the system in all the other districts, including the whole area within the fortifications, and even to extend it to some of the principal suburbs. Already about 60,000 feet of conduits have been laid, and one at least of the branch stations for storing the air has been completed and fitted up for use. The principal works at which the compressing process is performed are situated in the Rue Menilmontant, and occupying an area of about 7,000 square yards. The air is compressed to a normal pressure of six atmospheres, but the force actually employed in the local service is not so much as half of this. When the project has been fully worked out, the whole city will be supplied with conduits and accumulators, and the motive force will be supplied to those who require it at a set price in much the same way as gas and water.

Patent Stove Door Litigations.

The simple matter of supplying the oven doors to cook stoves with openings covered with wire gauze has become the subject of extensive patent litigations. The Filley patents are claimed to be the original Jacobs in this instance, and the value of the invention is held to be among the hundreds of thousands of dollars.

AMBER is dissolved in sulphuric acid and by pure alkalies. It can be made into a varnish by heating it very hot, pouring oil upon it, and stirring in a little turpentine as it cools.

ARCHITECTURE OF THE AMERICAN WHITE-FOOTED MOUSE (DEER MOUSE).

(*Mus leucopus, Audubon.*)

BY DANIEL CARTER BEARD.

It is a mistake to suppose that because you live in New York a long journey is necessary before you can see a real wilderness.

Some pleasant afternoon, next summer, cross one of the numerous ferries that land at the Long Island Railroad Depot, take any train, and before many minutes you will undoubtedly go dashing by some hopeless looking swamp lands.

Stop at the first station, walk back to the swamp that you have just passed, and, if you are not afraid of wet feet and torn clothes, enter. In five minutes' time you have not only lost all traces of civilization, but all signs of the presence of man!

The trees, whose interlocking branches overhead conceal the sky, might well be a thousand miles from any human habitation.

The almost impassable thicket of green briar, the festoons of cable-like wild grape vines, the rushes, the treacherous bog under foot concealed by a carpet of soft mosses, coarse grasses, and rank green skunk cabbages, is just the same in appearance as it was when the occasional tracks left by the moccasined feet of the red man were the only signs of human life in the vast wilderness of a continent!

You are face to face with Nature. Not in her most entrancing form, but always wonderfully beautiful when unmarred by the hand of man!

Here within sound of the screaming locomotives the woodcock rears its persecuted family. Here timid Bob White has found a temporary retreat, and even ventures to whistle, in a subdued tone, his well known call to his dapper little mate as she sits on her score of pretty white eggs.

Close by the inoffensive muskrat gnaws contentedly at a root; Rana pipens bellows forth his sonorous notes; red winged blackbirds, robins, catbirds, hawks, and owls build their nests and rear their young undisturbed by the dreaded small boy. The gray squirrel bounds among the branches overhead, and the beautiful little flying squirrel peeps from his hole in the red cedar, all as if the noise and smoke of a great city were not within hearing and sight but for the dense underbrush.

The poison sumac and thorny vines form a barrier which leaves no charms for the small boy and past which few pot hunters venture. The local sportsman is content to wait until Bob White and woodcock families are old enough to venture out of their retreat and be murdered in the most approved style of the war of extermination. It is in such neighborhoods that the white footed mouse abounds.

If you visit the swamp now, you will find the scene changed. Mr. Woodcock and all his family have left or been killed; Bob White and family have shared the same fate. The winds have stripped the trees of their leaves, and the frost has changed the grass from green to brown. The thickets and trees are gray and bare in the swamps, and the empty nests of the blackbird robin, thrush, and greenlet are now plainly discernible as dark objects against a leaden sky.

Did I say the nests were empty? So they appear at first glance, but an examination will show that some new tenant has been altering these summer houses and refitting them for winter quarters.

If you care to again venture through the briers of the swamp, and have not been warned by a swelled face and hands caused by the poisonous sap of the sumacs, you will probably be rewarded by seeing the nimble-footed, bright-eyed little tenants of last summer's birds' nests leap from their cozy quarters, run out to the end of a branch, there to stop and gaze wonderingly at you. If you remain quiet, the mice will return again to their nests, and with little trouble may be captured. Tie them up in your pocket handkerchief, and take them home—they will make pretty pets; and as these mice are nocturnal and sleep all day, you will be sure to find them awake and full of fun and capers at night, the only time a business man will have leisure to watch them.

Last Sunday I examined twenty or more birds' nests that I found in the low bushes of a bit of swamp land, only two of which had not been remodeled by Mus leucopus. I made careful sketches of three of these nests, reproductions of which accompany this article. The first shows the nest of a swamp blackbird that has been filled with the down from the seed stalk of the cat tail. Under this warm coverlid little Whitefoot can sleep snug and warm in the frostiest weather. The second sketch shows a nest that has been lined and roofed with moss; a doorway at the top and near the eaves, so to speak, furnishes an entrance and exit for the occupant.

The third sketch differs from each of the preceding ones in having a neat round hole cut through the side of the bird's nest, and an unmistakable roof made from the white inner bark of some tree covering the top of the nest. Although Audubon describes several nests which he found constructed by Mus leucopus "with nearly as much art as the nests of the Baltimore oriole," I am quite certain the little four-footed artisans in my immediate neighborhood seldom if ever take the trouble to build their own houses, much preferring that some other architect shall do it for them.

I have found white-footed mice occupying the nests of flying squirrels in red cedar trees, have seen them scamper from all kinds of birds' nests that are located within ten feet of the ground, have found their storehouses in the hollow rails of a fence, have dug the little animals out of the burrows of other small creatures, and have even caught them housekeeping in the walls of a round-topped muskrat's hut situated in the center of a frozen pond. Central Park probably shelters a number of these little animals. A very superficial survey, made upon the suggestion of the editor of the SCIENTIFIC AMERICAN, disclosed one catbird's nest near the reservoir that had lately been occupied by deer mice. Unlike the common house mouse, Mus leucopus has not been degraded and contaminated by living with the lords of creation; on the contrary, he avoids the habitation of man, preferring the sweet nuts, seeds, and berries of the woods to the refuse of the kitchen.

Although fond of Indian corn and grain of all kinds, such material appears to form but a small part of the mouse's diet. I have examined many storehouses of the white-footed mouse, and never yet discovered either wheat or grain in them, notwithstanding the fact that the stores examined were many of them located in the thickets bordering both corn and wheat fields.

When Indian corn is left standing in stacks late into the fall or winter, I must acknowledge that the good judgment of the deer mouse often causes him to select the stacks for a place to locate his winter residence; the perfect shelter, abundant food, and soft silk for nest-making offer inducements not to be overlooked by such a practical mind. The damage done the farmer, however, as a rule, is so slight as to be unworthy of attention. As a pet the white-footed mouse will be found to possess a timid and gentle nature, which combined with his small, agile form, brown back, white belly, delicate pink and white feet, and large, lustrous eyes, will seldom fail to win the affection of any one who cares for him. The pair that were captured in the muskrat house made willing captives, and lived contentedly in a high narrow cage built for them of wire netting.

A nest of the summer yellow bird, still resting in the fork of maple in which it was originally built, was fastened by wires to the side of the cage near the top. The mice took immediate possession of the nest, and used it as a dormitory until spring; but while the buds in the orchard and woodland still imprisoned the blossoms, and before the first swallow had made his appearance, my little captives destroyed the bird's nest and gnawed off a portion of the window curtain that accidentally fell against their cage, and with the material thus obtained they built a globular house on the green sod at the bottom of their cage. In the subcellar of the new dwelling an interesting family of little ones was born. The instinct, reason, or automatism (?) of the mice taught them that the bird's nest would be too small for a larger family, and with commendable common sense they erected a more commodious though less poetic abode on the ground.

The ingenuity that the deer mice display in adapting and remodeling such shelter as they happen to find, to suit their own wants, is to me more wonderful than the common instinct which teaches the Baltimore oriole to reproduce the same nest year after year, like the automatic work of the bee tribe in producing their geometrical honey cells.

ARCHITECTURE OF THE AMERICAN WHITE-FOOTED MOUSE.

Wooden Magnets to Cure Disease.

A curious example of the force of imagination is reported from Philadelphia. Dr. George C. Harlan, surgeon to the Wills Ophthalmic Hospital in that city, in the current number of the *Medical News* reports a curious case, showing the great influence of the mind upon the body, and the beneficial effects of a wooden magnet upon both. A young Philadelphia woman, Lizzie D. by name, applied at the Polyclinic, Thirteenth and Locust Streets, for relief from a disease of the tonsils. She was treated by Dr. Solis Cohen. Her disorder was attended with hysteria, and, like all hysterical people, the idea of being doctored filled her with delight. Shortly after her initiation, the nervous symptoms became more and more marked, and she was transferred to the care of Dr. Mills, the well known neurologist. Five or six weeks previously she had had pleuropneumonia, and after that paralysis attacked the arms. This was cured, but the disease manifested itself in the legs and feet. Besides this there was a numb feeling in the lower part of the body, and twitching on the right side of the face, similar to that seen in St. Vitus' dance.

Dr. Cohen applied a Charcot magnet in front of the ear. To his amazement the spasms on the side of the face touched by the magnet were greatly lessened in frequency and extent. It was evident that the cure was the result of imagination. After that she was attacked with eye troubles. At first there was no defect other than headache, after the prolonged use of the eyes, and some shortsightedness, but at length the right eye became, apparently, entirely blind, and muscular spasms of the most violent character disturbed not only the eye, but the face and neck. She was sent to the Eye Hospital, and treated by Dr. Hansell. After several examinations, the Charcot magnet that had proved so efficacious in the hands of Dr. Cohen was applied to the defective vision, and with the most astonishing result. After many applications, it occurred to Dr. Harlan that it would be a good idea to try the effect of unmagnetized iron of the same form and appearance of the magnet. A wooden "magnet" was procured, with iron tips, to give the metallic impression to the skin. It was placed in the drawer where the original Charcot instrument had been kept, and the patient was thoroughly ignorant of its character. Before it was applied it was noted that the pupil of the right eye was widely dilated, as in disease, and was perfectly rigid when exposed to a bright light. There was twitching of the muscles of the right side of the face.

The application of the wooden magnet had a wonderful effect. Shortly after the painted wood was applied with much seriousness to her head, the twitching of the muscles stopped, and the face assumed its normal appearance. Gradually the pupil of the right eye became of the same size as the other, and freely responsive to light. The wooden magnet had triumphed.

Dr. Cohen a short time ago had a case where the wooden magnet proved its efficacy. A patient of his fell down, and thought she dislocated her elbow joint. She was treated for that by a practitioner called in the emergency, and he discharged her with a stiff arm, which he said he was unable to straighten. Dr. Cohen examined the arm, and found no dislocation at all. He asked her to report at the surgical department of the Polyclinic for verification of his opinion. She called, and Dr. Steinbach noted extreme spasm of the biceps, the tendons being like whip cords. Dr. Cohen applied a wooden magnet, and the spasm relaxed at once.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—Southern District of Ohio.

ODELL *et al. vs.* STOUT *et al.*

Sage, *J.*, and Matthews, *J.:*

Letters patent, No. 250,934, for an improvement in roller mills for crushing or grinding grain, middlings, and other material, were issued December 13, 1881, and reissued (No. 10,139) June 22, 1882, to the complainant Odell, who (with Stillwell & Bierce Manufacturing Company, his licensees) sues for infringement. The object of the invention is stated in the specification to be to adjust the outer crushing or grinding rolls to or from the inner ones, and simultaneously to open or close the spouts or channels which control the discharge of grain from the hopper to the feed rolls.

The granting of a reissue is *prima facie* evidence of inadvertence, accident, or mistake, as the granting of original letters is *prima facie* evidence of invention. This evidence is not conclusive, nor is the action of the Commissioner of Patents *res adjudicata.*

The introduction into reissued letters patent of claims for the patentable parts of the combination claimed in the original letters does not invalidate the reissued letters, if the patentee was the first inventor of the patentable parts claimed, although the original patent was for the combination alone, so described and claimed that the parts were not to be used separately, but together and simultaneously.

A patentee may, under proper circumstances, by reissue, enlarge his claims so as to make them extend to the limits of his invention, but he is bound by those limits. He may not enlarge the invention.

Upon the authority of *James vs. Campbell* and other decisions of the Supreme Court, it is clear that the claim of a patent may be enlarged by a reissue if the patentee move promptly and no rights of others have intervened, and the delay in this case of six months is not unreasonable.

There is no rule fixing the precise time within which application for a reissue must be made. What is a reasonable time is a question, when a reissue is attacked, to be decided by the court upon the case presented. The rule is equitable, and therefore flexible, and to be applied according to equity.

The rule that an invention may be exhibited either in a drawing or model, so as to lay the foundation of a claim to priority (*Loom Co. vs. Higgins*) is to be taken with the qualification that it must be followed up with reasonable diligence. Merely making drawings is not such an embodiment of invention as will defeat a subsequent patent.

Patents granted between the making of a drawing by complainant and his filing an application a year afterward are not anticipated by his invention.

The invalidity of one of the claims of a reissued patent does not invalidate the entire reissue, provided the invalid claim was made in good faith. Where it appears that claims in a reissued patent were made to broaden the invention, and thereby to cover intermediate inventions or improvements, the fraud may so vitiate all the claims in the reissued patent that all will be held to be void; but one claim in a reissue may be void without necessarily invalidating the other claims.

If a defendant has, before suit brought, abandoned the manufacture and sale of an infringing machine, and the court is satisfied that the abandonment was in good faith and final, an injunction ought not to be granted. But if the defendant, after such abandonment, has engaged in the manufacture and sale of another machine which is also an infringing machine, and suit is brought for both infringements, the court will retain the whole cause under its control, and make the injunction and order to account to apply to the manufacture and sale of both.

The first claim of reissue letters patent, No. 10,139, granted to complainant Odell, June 22, 1882, for an improvement in roller mills for crushing or grinding grain, middlings, and other material, *held* to be invalid; the second and fourth claims sustained. Complainants required to file a disclaimer of the first claim before decree, and the decree for an injunction and account to be without costs.

The New South Wales National Park.

The government of New South Wales have followed the example set by the American people in reserving the Yellowstone Park as a ground to be kept for ever in its pristine state. The Australians have resolved to preserve one of the finest and most picturesque portions of the colony for a national park. The latter is situated in the Illawarra district, and embraces an area of 36,000 acres, having a frontage of 7½ miles to the Pacific Ocean. The park generally may be described as high table land, from which at numerous places excellent and extensive views are obtained of the ocean, Port Hacking, Botany Bay, Sydney, Randwick, etc., with deep gorges and rich flats, covered with beautiful foliage, bordering running streams of the purest fresh water. The high table lands, to some extent, consist of the comparatively barren stony heaths, and of fair to good land, the latter in areas suitable for formation of recreation, review, and encampment grounds, or of plantations of ornamental trees, etc., and readily accessible, situated at elevations of from about 350 feet to about 900 feet above high water mark.

The valleys of the principal water courses, notably of Port Hacking River and Bola Creek, are to a large extent covered with rich foliage, including cabbage tree and bangalo palms, tree-ferns, Christmas, myrtle, and other handsome shrubs, numerous large, well grown blackbutt, woolybutt, turpentine, and other noble forest timber trees, rising at the part southerly and southeasterly above the confluence of Bola Creek with Port Hacking River, to heights up to nearly 200 feet, and bordering and adjacent beautiful streams, having occasional long reaches of deep, shaded, pure, cool, fresh water. The park will be made easily accessible from Sydney by the Illawarra Railway, now in course of construction, which will traverse a considerable portion of what may be regarded as one of the finest public recreation grounds in the world.

Bogus Gold Dust.

A few days ago there were received through the Adams Express at the Philadelphia Mint deposits "on account of Charles S. Stief, of Little Rock, Ark., and Meyer Cohen, of Nashville, Tenn.," of what appeared to be gold grains. The difference in the specific gravity between the deposits and gold of a like character attracted the attention of the clerk who had them in charge, and he exhibited them to Colonel A. Loudon Snowden, Director of the Mint, who at once declared them to be imitations, and ordered an analysis to be made. The result disclosed that the deposits were steel filings covered with gold, which was made to adhere to them by a composition of some kind, into which turpentine largely entered. It is supposed that the filings were soaked in the composition, and then put in some receptacle with thin gold leaf, and shaken up until thoroughly covered with the adhering gold. The filings, when thus treated, presented an appearance closely similar to African gold grains or North Carolina amalgam from which the quicksilver had been drawn off by retorts. Colonel Snowden, however, detected that they were imitations at a glance, from the fact that there was too great a similarity or regularity between the forms of the grains. The imitation was recognized as dangerous in its character even to the ordinary expert bullion dealer, as the gold used in the process was of the value of about a dollar an ounce of the filings—a heavier coating, Colonel Snowden remarked, than ordinary plating, and one which resisted the acid test, which test is the main reliance of the bullion buyers. It is supposed that the bogus gold is being manufactured by persons who are disposing of it in small quantities, as these two deposits assayed each about 10 ounces.

Oysters.

It may not be generally known that according to observations made by Professor Rice at the Cold Spring hatchery, a healthy, well fed oyster, the surroundings being favorable, will lay 128,000,000 eggs. Of the number that acquire a shell the percentage is very small, as nearly all the finny tribe are as fond of oyster eggs as is man of the mature bivalve. Being left to shift for themselves, they are devoured by the million before the protecting shell is formed.

The eggs hatch in less than a day, often taking no longer than four hours, and when hatched they are free to swim and roam at will, but in a few days, usually four, they begin to round up and take the shape of a clam. At this stage they settle on convenient objects, such as rocks, pieces of iron, clam or oyster shells, and in fact on anything that may be on the bottom. This is the end of the young oyster's freedom, as where it settles there it remains until torn off to be transplanted in the oysterman's beds.

But man is not the only enemy of the oyster, as the star fish lives on oysters the year round. Its mode of opening is a somewhat novel way of shucking oysters. Settling down bodily on the young or old oyster, with its five long arms arranged around the edge of the shell in such a way that the moment the oyster opens its mouth to breathe or feed the star fish injects its juice into the opening, which kills the occupant of the shell in a short time. Then commences the feast on a raw oyster. The presence of the fish and his designs are well understood by the oyster, which will keep as close as a clam for as long as a week or eight days.

The other enemy, and probably the more destructive of the two, is the drill, a small worm-like snail, that is deposited on the shell in the form of an egg, which as soon as it is hatched begins boring its way in to the unsuspecting occupant. The story is soon told when once through the pearly enamel of the stony armor of the otherwise defenseless oyster.

Again, according to the profane affidavit of an Eastern Shore oyster man, snappers and turtles are the sneak thieves of the oyster beds, whose method is different from the birds or fowls, which catch the oyster, and rising to a sufficient height in the air drop the oyster on the rocks, then follow and partake of an oyster hash. The snapper is not so flighty, but works and carries the oyster to land, where he leaves it to die from exposure, and then calls around and gets a meal good enough for anything that takes such a mean advantage of a defenseless mollusk.

Steam on London Tramways.

A satisfactory trial has taken place of one of the fifteen steam tramway locomotives now being constructed by Messrs. Merryweather & Sons, of Greenwich, for the North London tramways. These engines have cylinders 7½ inches diameter by 12 inches stroke, and are each capable of drawing three loaded cars at a speed of eight miles per hour, and at a stated working cost of 30 per cent less than horse power. It is expected that the whole of these engines will be running in the course of the next two months.

To Imitate Furniture Wood.

After the color has been applied to the panel, take a large dusting brush of the kind used by painters, and working the reverse way of your color, lightly pass over the surface with the tips or ends so as to blend together, as it were, the light and the dark. Quickness of manipulation is essential to obtain the desired effect while the color is wet, for it dries or "sets" very quickly. Use judgment in passing over the work, so as to vary the "beating" by turning your hand according to the various directions the veins have taken when first laid on.

Next take a piece of wash leather, damped and folded, to form a round, elongated edge, and proceed to wipe out all the light parts lying between the heavy color; then with another piece of leather fastened on to the end of a stick, and brought to a point like a pencil, proceed to cut out all the finer lines. If you find that your color sets while working, you must dab it on the surface—not rub it, else you will probably wipe off all the color. As soon as the panel is dry, you can, by means of a flat fitch, proceed to put in all veins (or ' worms" as they are sometimes called) which cross the grain, by using a little burnt umber diluted with beer to the necessary tint. If you want the work to have dark shades on its surface, then you must work in a little Vandyke brown. These dark shades and veins can be formed with a camel's hair or sable pencil, and blended together with the badger.

Passing on next to mahogany, we shall see by examining a piece of Honduras wood that it is much easier to imitate mahogany than oak. When the ground color is thoroughly dry, smooth and level the surface so that the brush marks shall be hardly discernible. Attention to this point will materially contribute to secure a good imitation. After this, proceed as before to remove with a damp wash leather all grease and dust. You will be able to judge whether the surface be free from grease or not, since no moisture will be absorbed by such spots, but they will appear dry and shining. If necessary, you may use soap and water. Some grainers will even rub the surface over with whiting and water, which has a good effect. Having prepared some Vandyke brown ground and mixed in beer, proceed to thinly spread it over the work, and while the color is quite wet freely dab a piece of sponge over it to gain the effect of light and dark shades, at the same time drawing the sponge a little. With your "softener" proceed next to blend the edges of the dark into the light shades, so that the eye may not perceive any broken lines or edges, and toward the finish use the softener (or badger) in the direction of the grain, or rather in the direction in which the dark veins of the mahogany are intended to run. When the work is dry, get a tint of Vandyke brown ready, and with a tool filled with a little color form the lightest of the dark veins or shades, using a drier brush to obtain the effect of a kind of over grain. These veins ought to run in the direction of the light, above and below it. A little practice will soon familiarize you with this process. To gain a nice rolled mottle, as it were, a light dab of color must be given just under the lightest portion, so as to render it solid and opaque. Next blend all well together, which can be done, in the first instance, by means of the dusting brush before mentioned, while the badger may be employed for the finishing touches. —*The Manufacturer and Builder.*

Russia's Gold Production.

According to Suess, the present gold production of the world is about $117,000,000, two-thirds of which are gained from placer washings. From 1820 to 1850 Russia ranked first among gold producing countries, yielding at the time of the discovery of the mines of America and Australia 12·7 per cent; from 1861 to 1870, 14 per cent; and at the present time about one-fifth of the world's production. As elsewhere, gold is gained in Russia either by quartz crushing or placer washing, the yield of the latter system far exceeding that of the former.

The originally high percentage of gold in Russian placers has, with the exception of the mines of Olekminsk, invariably decreased, and in some instances the places have been exhausted. In contrast to this fact the production of gold has annually increased. This anomaly finds its explanation in the fact that the mines, successively developed, were not simultaneously exhausted; that beginning in the Ural Mountains, the gold producing center, moving gradually eastward, revealed new fields whose virgin wealth made good the decrease of the older mines; and that the amount of sand washed, as well as the extent of country worked, has constantly and enormously increased.

When to Clean the Teeth.

Of all the people who clean their teeth regularly, it is certain that a very large proportion only do so once a day, and that generally at the time of their morning ablutions. A much smaller number also do so at retiring, but the number of those make a practice of regularly brushing their teeth after eating, the most important time of all, is indeed very small. It is while eating that all little cavities or interstices between the teeth become the repositories of fragments of food, or traces of some acids in the food are left on the teeth, to cause incipient decay, and hasten it where it has already commenced. It is of course desirable to brush the teeth on rising in the morning and before retiring at night, but it is of infinite more importance that they should be thoroughly cleaned after eating.

MISCELLANEOUS INVENTIONS.

A type writing machine has been patented by Mr. James W. Cole, of Spearville, Kansas. This invention covers a special construction and combination of parts, embracing many novel features, and making a machine that is operated with facility.

A wear hook for back pad billets has been patented by Mr. Orange A. Dean, of Parkville, Ill. It is intended more especially for use on the billets of the back pads of harnesses where the billets pass through the trace buckles, for preventing rapid wear of the billets, and the invention covers special details of construction.

A side spring vehicle has been patented by Mr. William J. Wayne, of Decatur, Ill. This invention covers an arrangement of cranked rods and leaf springs by which the greatest elasticity of the springs is realized without imposing undue strain on the side bars or body of the vehicle.

An opera glass has been patented by Mr. Carl Rothacker, Jr., of Pforzheim, Germany. It is adapted to be folded into the form of and carried as a watch chain trinket, having a folding or collapsible frame, instead of the usual telescopic double barreled body.

A fruit drier has been patented by Mr. Arthur Thompson, of Warner, N. H. It is provided with revolving shelves and has a suspended cylindrical deflector, whereby ascending hot air is deflected to the curved walls of a case and made to pass up through revolving tray holders containing trays of fruit.

A design for a tag holder or fastener has been patented by Mr. Walter E. Preble, of New York city. It consists in the representation of both an alphabetical and numerical figure, the figure **8** having a rectangularly shaped upper looped portion, while the crossing is made straight limbed to represent an **X**.

A knife ring has been patented by Mr. Charles H. Wickersham, of Pottstown, Pa. It has guards to retain it in place on the finger, and is made to close up compactly when not in use, furnishing an implement for the use of clerks and others who have frequent need of a knife for cutting strings on packages.

A combined torch and battle ax has been patented by Mr. Abraham Wolf, of New York city. The battle ax is made of two plates soldered to each other at their front and rear edges, having sockets to receive the staff, the upper one of which is soldered to the torch, the whole being designed for use in torchlight processions.

An extinguisher for lamps has been patented by Mr. William Milien, of New York city. It consists of a plate having clasp plates or tongues and an extinguishing plate hinged thereto, which can be used as well to make the wick more even as to suddenly smother the flame without any smoke when used as an extinguisher.

A thill coupling has been patented by Mr. Henry W. King, of Canaan, N. Y. It is made with a U-shaped leather strap passed through the eye of the thill iron, and secured to the projecting end of the clip yoke by a cap plate and a bolt, and has other novel features, the design being to prevent noise and promote security and convenience.

A churn cover attachment has been patented by Mr. Edmund E. Risien, of San Saba, Texas. It consists of a loose supplementary ventilating lid, designed to be slipped over the handle of the churn above the lid proper, to prevent the milk or cream from splashing out while being churned, and also to freely admit air to the interior of the churn.

A fire and water proof roofing paint has been patented by Messrs. Charles H. Phillips and Wallace M. Taylor, of Alpena, Mich. It consists of tar, hydraulic cement, sulphur, red lead, air slaked lime, mineral paint, salt, potash, plaster of Paris, and borax, in certain specified proportions, and mixed in a prescribed manner.

A baling press has been patented by Mr. John A. Hampton, of Houston, Texas. This invention covers a special construction, arrangement, and combination of parts, for improving stationary and portable baling presses, more especially designed for baling hay, the machine being easy to handle, cheap and durable, and rapid in its action.

A traction wheel has been patented by Mr. James A. Stout, of Belleville, Ill. Its rim is concave on the outer surface, and has reversely inclined consecutive ribs, disconnected at their ends, and with straight flat faces, combining lightness with strength, and reducing the tendency of the wheel to lift the earth or dirt, while giving increased pulling or tractive effect.

A machine for mincing meat has been patented by Mr. Hubert Dollman, of Birmingham, Warwick County, England. This invention covers a novel construction and arrangement of parts in a machine to which meat may be fed through a hopper, where it is cut into small pieces, then fed forward by a spiral flange and forced through perforations, and again cut before being discharged.

A bale band splicing machine has been patented by Mr. Frederick Bommarius, of New Orleans, La. It is for expeditiously and efficiently splicing metallic bands used in baling cotton, and for utilizing the scrap or surplus lengths of other baling bands after the bales they are used on have been reduced by compression, for which purpose the invention presents several novel features.

A twenty-four hour time piece has been patented by Mr. Henry C. Fick, of New York city. The first twelve hours of the day are indicated on the dial in the ordinary way, and the last twelve by figures 13 to 24 at the outer or inner side of the circle of the ordinary figures, a third hand being interposed between the two ordinary hands, adapted to be thrown out of gear or in gear with the other hands, with other novel features.

A side bar wagon has been patented by Mr. George D. Selby, of Portsmouth, Ohio. The invention consists in extending the side bars back over the rear axle, and combining with such extended portions a spring or springs, in connection with other springs, to support the body of the vehicle and equalize the load, making a light vehicle in which springing and sagging of the side bars and couplings are avoided.

A fastening for hand bag and pocket book frames has been patented by Mr. John Mehl, Jr., of Jersey City, N. J. This invention relates to fastenings in which two balls on opposite sides of the frame snap by each other when the frame is closed, and consists in hinging or pivoting to one of the balls a bar adapted to engage the other balls and positively lock the two together, so the frame will not open when dropped, or after having been used for a while.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) O. Z. writes: I am building an engine 2x3. 1. How much horse power would it give, and revolutions? A. At 350 revolutions per minute, about 1¼ horse power. 2. What size of boat would I have to get? A. 15 or 16 feet long and 3 feet 4 inches beam. 3. What size of propeller would I want? A. Propeller 16 to 18 inches diameter. 4. Would boiler without tubes raise plenty of steam? A. A boiler without tubes would be too heavy. 5. What size boiler would I need? A. Boiler should have not less than 30 or 32 feet fire surface. 6. How fast would the boat travel? Engine dimensions 2x3, eccentric seven-sixteenths throw, stroke 3 inches, and a pump to force water into the boiler. A. Probably 8 miles per hour with good model.

(2) A. W. B. writes: You have several times stated in your SCIENTIFIC AMERICAN that there is nothing better for truing a grindstone than a piece of gas pipe; now, how is it to be applied to the stone—held on by main strength, or secured to the frame in such a way that it can be moved up square against the face? A. Lay a flat iron bar across the grindstone frame as close to the stone as possible without touching. Take a piece of ¾ gas pipe 2 or 3 feet long, and hold it at about 45°, with the end resting upon the iron plate. Roll the pipe slowly across and against the face of the stone, holding the pipe firmly to its place, so that the stone will bite upon the end of the pipe. The pipe will wear away, as well as the stone; rolling it will keep the end even.

(3) H. T. C. asks how a car gets around a curve, it being farther on the outside rail than it is on the inside, the wheels being fixed on the axles. I claim one of the wheels must slip. A friend claims they do not, and explains it thus: The flanges of the wheels do not run close to the rails, there being about the space of an inch play room, and that the surface of each wheel is beveled, being the largest next to the flange, so that in rounding a curve the trucks naturally crowd to the outside, and the inside wheel runs on that part of it which is the smallest, while the outside wheel runs next to the flange, or the largest part. A. Both are correct. With conical wheels there is no slip when the curve exactly coincides with the difference of circumference due to the coning of the wheels and the difference between the gauges of rail and wheel. In all other cases there is more or less slip.

(4) J. B. asks if a cylinder should or should not be counterbored so that the packing rings' front edges run over so as to preclude the possibility of wearing the bore of cylinder to a shoulder. A. The counterbore should not be carried so far as to allow the rings to lap more than one-quarter of their width, nor less than one-eighth their width. 2. What would be the right depth of counterbore for a 16x24 engine whose packing rings travel to within 2 inches of end of cylinder when connecting rod brasses are in proper condition? A. In your engine, 2¼ to 2¾ inches.

(5) C. R. writes: We have an upright engine, and use a cut-off in the steam chest; when we wish to cut-off at half or quarter stroke, there is so much water formed as to cut all the piston rod packing. Will you tell us how to get rid of this water? A. Not knowing the construction of your engine or its appliances for discharging the water of condensation from steam chest or cylinder, we cannot be expected to give an intelligent answer. The smaller amount of steam passed through the cylinder at the reduced cut-off may be the cause of retention of the water of condensation. A drip pipe from the bottom of the steam chest and also at the bottom of the cylinder are necessities. The one from the steam chest should be connected with a steam trap.

(6) J. F. M. asks: 1. Has a chairman of a public meeting a right to "second a motion"? A. No. 2. Is there any appliance for receiving an uneven power from a wind engine and emitting it regular and even to the machinery for making flour or other manufactures? If so, by whom made, and where? A. The "storage of wind power," which is in reality a regulator or equalizer of power, has been largely discussed, and many appliances proposed, in back numbers of the SCIENTIFIC AMERICAN, which we refer you to for details. We know of no special appliance on sale. 3. Is the expression "value received" necessary on a negotiable promissory note? If so, why? A. It is, to avoid a legal technicality as to its legitimate representation of a business transaction.

(7) W. A. P. writes: Mr. Rassam, in his explorations on the Euphrates, is credited with having found a great number of tablets, giving a history of the creation, the sin of our first parents, and in fact a history of the world down to the flood. Could you tell me if those, as well as the tablets found at Babylon, have been translated into English, and if so, where the work can be procured? A. The British Museum has become the custodian of many of the tablets found in the valley of the Euphrates. The translations are very meager and uncertain. They have been the subject of contradictory discussions in the Oriental societies of Europe. The publications in regard to them are principally the narratives of the explorers, which may be obtained at your libraries and bookseller's.

(8) G. W. C. asks: How can I make some transparent varnish or enamel that will not crack or break when applied on cloth? I would like something such as on nice finished oil cloth to cover tables. A. The elastic varnishes that are used on cloth are usually made with linseed oil boiled with litharge and rubber dissolved in naphtha, mixed with various colors like paint. These ingredients are mixed and boiled to the consistency of a paste, and applied to the cloth with a scraper. The goods are then dried in an oven. The enameling of cloth is not intelligibly treated of in books, every manufacturer having his special secret in regard to the mixture. A thin varnish for finishing may be made with boiled linseed oil and rubber dissolved in naphtha, spread with a brush.

(9) J. C. W.—Roper's works are good. Presuming that you wish to become a mechanical engineer, we recommend you to become an apprentice in some engineering establishment near by, and devote your spare hours to study and draughting. Acetic acid is not injurious in proper quantities. The acid property of vinegar is mainly due to acetic acid. Vinegar made from cider contains both acetic and malic acids. You may find interesting articles on the manufacture of vinegar in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 247, 392, 396.

(10) D. S. N. writes: We are heating our office with steam, also running engine for presses with steam from the same boiler; have about 7 horse power; boiler, tubular, without steam dome; does not do so well on account of not having enough dry steam. Would there be any advantage in using an upright boiler, and which takes the most fuel to run—an upright or a tubular boiler? A. It is the opinion of most engineers that a well made and properly set horizontal tubular boiler is the most economical of all the forms. The wet steam that you complain of may come from carrying the water too high in the boiler. For the best result, it should be kept at from 2 inches to 4 inches above the tubes in small boilers. You may also gain considerable advantage by arranging your heating pipes so as to turn the exhaust steam into them when running the presses, thereby utilizing the waste steam and adding its value to the boiler for power.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

C. R. K.—No. 1 is an iron ore, the hydrated ferric oxide, or limonite. No. 2 is a copper ore with traces of malachite or chrysocolla on the surface. It may carry silver. No. 3 is a clay rock, and does not appear to carry any metal. No. 4 is sphalerite, or zinc blende, consisting of zinc sulphide. It is a valuable ore of zinc. No. 5 appears to be a rock coated with thin, shiny particles of mica, and is probably of no value. No. 6 is galena or lead sulphide, and is likely to carry silver. An assay costing $5.00 will be necessary in every instance to determine the presence and amount of the nobler metals contained in the ore.—A. M.—The specimen consists of a gneissitic rock, partially decomposed. Particles of mica that are quite shiny and gold-like in appearance are on one side. Some garnet-like crystals also appear on one of the sides. As a mineral it is worthless, and as a rock it has no economic value.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

December 16, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable swinging bracket, R. Hart 309,249
Advertising device, automatic, W. Akin 309,182
Alarm. See Burglar alarm.
Amalgamator, Hare & Higley 309,513
Auger handle, W. A. Peck 309,313
Ax or similar tool, J. H. Whiteley 309,369
Bale band splicing machine, F. Bommarius 309,375
Baling press, J. A. Hampton 309,387
Bandage machine, E. T. Tinch 309,511
Belt fastener, J. Neale 309,310
Bird cage feeder, B. A. Drayton 309,238
Bit holder, H. Wilson 309,276
Boiler. See Steam boiler. Water tube boiler.
Boiler for heating purposes, H. Burt 309,436
Boiler heating apparatus, W. N. Page 309,311
Bolting cloth, device for stretching, G. T. Smith 309,498
Bolting cloth, device for tightening, C. A. Smith 309,497
Boneblack, cleansing or revivifying, P. R. Gray 309,222
Book, W. W. Brewer 309,190
Books for binding, preventing errors in assembling signatures of, D. M. Smyth 309,319
Boot and shoe uppers for lasting, preparing, W. C. Cross 309,440
Bottle capping machine, W. Redlich 309,358
Bottle filling machine, Hafner & Geer 309,455
Bottle filling machines, sirup gauge for, H. Will 309,427
Bottle washer, C. Mussel 309,401
Box nailing machine, J. H. Foster 309,297
Bracket. See Adjustable swinging bracket. Ladder bracket.
Brake. See Car brake. Steam brake. Vehicle brake.
Brake shoe, A. R. Bidwell 309,287
Brick machine, J. Tiffany 309,367
Brick, manufacture of highly refractory silica, I. Reese 309,230
Brick mould sanding machine, M. & J. Bierline 309,186
Bridge, G. W. & T. G. Blackman, Jr 309,289
Buckets, well for slop, Menke & Kroll 309,351
Burglar alarm, Sims & Shorkes 309,412
Butter chest, J. W. W. A. Brothers .... 309,[illegible]
Buttons, making, G. W. Prentice 309,315

Calendar, perpetual chronological, J. C. Welch.... 309,271
Can varnishing apparatus, F. A. Glaeser.......... 309,343
Canopy support, F. G. Ford.......... 309,451
Car brake and starter, R. W. Evans.......... 309,383
Car coupling, C. N. Alderman.......... 309,329
Car coupling, M. Buch.......... 309,194
Car coupling, Howe & Green.......... 309,463
Car coupling, A. J. Jourde.......... 309,229
Car door, grain, J. Brenzel.......... 309,291
Car heater, J. Zimmerman.......... 309,279
Car replacer, Kelly & Lee.......... 309,290
Carburetors, bucket for measuring wheels of, W. M. Jackson.......... 309,466
Cardboard, machine for cutting, C. Baillie.......... 309,433
Carrier. See Cash and parcel carrier.
Carving fork guard, G. H. Packwood.......... 309,356
Case. See Watch case.
Cash and parcel carrier, M. Clark.......... 309,202
Cash and parcel carrier, Clark & Cowley.......... 309,505
Cash register, T. Munnell.......... 309,240
Caster, furniture, C. A. Whitney.......... 309,273
Check hook, R. W. Jones.......... 309,508
Chuck, lathe, G. Birkmann.......... 309,288
Chuck, lathe, A. F. Cushman.......... 309,206
Churn, J. H. Cookus.......... 309,204
Churn, P. Kirby.......... 309,470
Churn, C. T. Shadbolt.......... 309,410
Churn, J. F. Towner.......... 309,500
Churn cover attachment, E. R. Risien.......... 309,405
Clasp. See Pencil clasp.
Clasp, C. C. Shelby.......... 309,258
Clock, calendar, J. K. Seem.......... 309,257
Clock pendulums, synchronising device for, W. F. Weisgerber.......... 309,269
Clothes pin, D. S. Earhart.......... 309,382
Clothes wringer, H. Baumgartel.......... 309,284
Coal and coke reservoir, portable, M. G. Tousley. 309,263
Coffin pedestal, L. K. Smedes.......... 309,364
Comb. See Curry comb.
Compound engine, F. W. Jenkins.......... 309,228
Corset, K. C. Clark.......... 309,334
Corset, T. S. Gilbert.......... 309,385
Corset, J. R. Haviland.......... 309,460
Cotton press, double revolving, J. Bennett.......... 309,285
Coupling. See Car coupling. Hose coupling. Pump rod coupling. Thill coupling.
Crib, child's, S. H. Bullock.......... 309,376
Culinary utensils, C. M. Raines.......... 309,249
Cultivating the soil, apparatus for, J. Cooke.......... 309,337
Cultivator, J. A. Grayson.......... 309,345
Cultivator, L. A. Ruhl.......... 309,361
Currycomb, H. C. Brill.......... 309,191
Cutter. See Weed cutter.
Detector. See High and low water detector.
Disinfectant, A. E. Duncan.......... 309,211
Disinfecting baled rags, etc., apparatus for, Parker & Blackman.......... 309,488
Drier. See Grain drier. Fruit drier. Sand drier.
Drier, A. Munzinger.......... 309,485
Duplex compound engine, C. C. Worthington.......... 309,278
Dust pan, L. B. Fletcher.......... 309,215
Ejector, S. S. Fertig.......... 309,214
Electric light conductor, W. R. Patterson.......... 309,246
Electric wire support, A. S. Weaver.......... 309,267
Electrical connection between a moving and a stationary electrical instrument, apparatus for maintaining, C. W. Williams *et al*.......... 309,274
Electrodes for secondary batteries, making, W. E. Case.......... 309,293
Elevator, W. L. Folstead.......... 309,449
Engine. See Compound engine.
Explosive compound, J. C. De Castro.......... 309,441
Face protector, P. Price.......... 309,491
Fence, J. Newton.......... 309,242
Fence, portable, W. S. Stockbridge.......... 309,320
Fence wire fastener, J. Speed, Jr.......... 309,415
Fender. See Bird cage fender.
Fertilizer distributer, H. O. Peabody.......... 309,404
File cutting machine, S. Hamblin.......... 309,458
Filler, L. V. Sone.......... 309,319
Firearm, breech-loading, F. & H. Vetter.......... 309,265
Firearm, electric, R. H. S. Thompson.......... 309,262
Firearm magazine, W. H. Elliot.......... 309,213
Firearm sighting attachment, T. Gilbert.......... 309,342
Fire lighter, automatic, W. L. & J. A. McGintie.. 309,396
Fishing reels, making, J. Kopf.......... 309,305
Flanging machine, J. O'Brien.......... 309,358
Food for animals, E. Wylam.......... 309,502, 309,503
Frame. See Quilting frame.
Fruit drier, G. R. Scates.......... 309,256
Fruit drier, A. Thompson.......... 309,419
Fruit gatherer, C. I. Saunders.......... 309,362
Furnace. See Hot air furnace. Smoke consuming furnace.
Gas, apparatus for enriching coal, I. James.......... 309,467
Gas, apparatus for making hydrogen, W. H. Bradley.......... 309,290
Gas, process of and apparatus for producing, J. Reese.......... 309,251
Gas regulator, G. Taylor.......... 309,260
Gate, E. Cowan.......... 309,512
Generator. See Steam generator.
Grain drier, H. I. Chase *et al*.......... 309,294
Grain separator, J. B. Martin.......... 309,394
Grate attachment, E. Wood.......... 309,429
Grate shelf, portable, Durnell & Beets.......... 309,445
Grinding mill, J. T. Case.......... 309,196
Grinding mill, O. Hoffmann.......... 309,302
Grinding mill, W. C. Westaway.......... 309,326
Guard. See Carving fork guard.
Handbag and pocketbook frames, fastening for, J. Mehl, Jr.......... 309,397
Handle. See Auger handle. Saw handle. Tool handle.
Harness, A. Sherwood.......... 309,317
Harrow tooth, L. J. Stanton.......... 309,416
Harvester, S. D. Maddin.......... 309,234, 309,235
Harvester attachment, Clark & Hankinson.......... 309,208
Harvester, corn, W. L. Hopper.......... 309,462
Hatchway, self-closing, P. V. Ball.......... 309,330
Heat regulator, H. W. Axford.......... 309,183
Heater. See Car heater.
Heating apparatus, E. E. Gold.......... 309,299
Heel or counter stiffeners machine for the manufacture of, J. L. Hatch.......... 309,223
High and low water detector for steam boilers, electric, C. H. Wickersham.......... 309,425
Hinge, J. H. Lawrence.......... 309,398
Hoisting machine, W. H. Stewart.......... 309,499
Holder. See Rein holder. Sash holder. Vehicle stake holder.
Holder for articles while being heated, C. F. O. Nordin.......... 309,402
Hook. See Check hook.
Hoop fastener, N. Newman.......... 309,487
Hose coupling, W. B. Dunning.......... 309,444
Hot air furnace, D. M. Russell.......... 309,495
Ice machine absorber, N. W. Condict, Jr.......... 309,336
Ice, process of and apparatus for making, F. V. De Coppet.......... 309,442
Injector, J. M. Marty.......... 309,478
Injector, J. H. Rook.......... 309,406
Insulating electric wires, M. D. Fenner.......... 309,450
Iron. See Sad iron. Soldering iron.
Jetty, movable, R. T. Van Norden.......... 309,264
Joint. See Railway rail joint.
Journal bearing, J. Graham.......... 309,386
Journal bearing, J. H. McLean.......... 309,341
Key, J. H. Shaw.......... 309,411
Knife ring, C. H. Wickersham.......... 309,426
Knitting machine, I. W. Lamb.......... 309,471
Knitting machine, circular weft thread, F. Hardenbergh.......... 309,301, 309,348
Lacing, shoe, A. C. Mather.......... 309,308
Ladder bracket, J. R. Bodell.......... 309,435
Ladder, step, C. G. Udell.......... 309,322, 309,323
Lamp, electric arc, H. A. Gorn.......... 309,454
Lamp, electric arc, T. L. Kay.......... 309,392
Lamp extinguisher, W. Millen.......... 309,398
Lamp, miner's safety, J. B. Marsaut.......... 309,309
Lanterns, cone securing device for tubular, F. Dietz.......... 309,308
Lap ring, E. W. McLendon.......... 308,482
Lime, plant for and process of making, Wellman & Goetz.......... 309,270
Lime, slaking, W. I. Adams.......... 309,328
Liquid drawing device, automatic, W. H. Fruen.. 309,219
Lock keeper plate, F. W. Mix.......... 309,238
Locks in place, securing cabinet, G. B. Cowles.... 309,205
Looms, positive shuttle motion for, Day & Bristol.......... 309,207
Mail bag fastener, B. F. Kraft.......... 309,231
Meat mincing machine, H. Dollman.......... 309,381
Mechanical movement, A. May.......... 309,236
Metal, expanding and anti-friction, G. Hayden... 309,350
Meter. See Water meter.
Mill. See Grinding mill.
Mining machine, coal, Hoffn & High.......... 309,225
Nail, J. W. G. Smith.......... 309,414
Nail machine, wire, R. Egli.......... 309,446
Nail machine, wire, G. H. Ryan.......... 309,255
Necktie and collar fastener, F. D. Adams.......... 309,431
Necktie fastening, G. R. Hughes.......... 309,465
Oar, rowing, F. A. Allen.......... 309,504
Opera glass, C. Rothacker, Jr.......... 309,407
Ordnance, breech-loading, B. B. Hill.......... 309,224
Ores, etc., machine for pulverizing, J. C. Blevney. 309,187 to 309,189
Oven, W. H. Thompson.......... 309,366
Packing pad, I. B. Wollard.......... 309,327
Pad. See Packing pad.
Paint, fire and water proof roofing, Phillips & Taylor.......... 309,490
Painting wire screens, apparatus for, C. J. Shipley.......... 309,363
Pail bearer and luggage hook, A. M. Scott.......... 309,406
Pan. See Dust pan.
Paper making machines, joint for steam pipes in, G. W. Hall.......... 309,457
Paper ware from pulp and machine therefor, manufacture of, H. Whittingham.......... 309,424
Parcel fastening, P. G. Hubert, Jr.......... 309,303
Pawl and ratchet, J. Thomson.......... 309,420
Pencil clasp, H. W. Mason.......... 309,307
Pencil measuring attachment, I. B. Millner.......... 309,483
Pill coating apparatus, E. L. Patch.......... 309,243
Pin. See Clothes pin.
Pipe cutting and threading machine, Bignall & Whitman.......... 309,374
Pipe joint, lead, W. R. Patterson.......... 309,247
Pipe stem, J. Locher.......... 309,473
Pistol holster, pocket, G. W. Browne.......... 309,292
Plane, joiner's, G. D. Mosher.......... 309,400
Planing and matching machine, W. M. Dwight... 309,339
Planter and seed sower, combined cotton, E. E. Hughes.......... 309,464
Planter feeding mechanism, grain, E. C. Edmondson.......... 309,212
Plow, J. Garfield.......... 309,453
Plow and harrow, combined, C. Perkins.......... 309,248
Plow, steam, B. S. Benson.......... 309,434
Plow, sulky, W. S. Pates.......... 309,489
Power machine, weight, M. Vandercook *et al*. ... 309,422
Press. See Baling press. Cotton press.
Printing press, J. M. Jones.......... 309,304
Printing press color inking apparatus, M. Gally... 309,220
Profile cutting machine, F. A. Schmidt.......... 309,316
Protector. See Face protector.
Pump, L. Bouvier.......... 309,331
Pump, N. W. Condict, Jr.......... 309,335
Pump, S. Hanford.......... 309,347
Pump, T. Rose.......... 309,493
Pump, air, L. S. Hoyt.......... 309,391
Pump rod coupling, B. C. Vanduzen.......... 309,324
Punching machine, metal, A. Andersen.......... 309,432
Quilting frame and table, J. F. Rickenbrode.......... 309,252
Railway crossing, J. A. Goodrich.......... 309,344
Railway grip mechanism, cable, I. Hyde.......... 309,506
Railway rail joint, S. McCarty.......... 309,479
Railway rail joint, C. A. Miller.......... 309,399
Railway tie, J. H. Williams.......... 309,428
Refrigerating and apparatus therefor, T. Rose... 309,494
Refrigerating apparatus for cooling storage bins, barrels, etc., H. Luhmann.......... 309,233
Refrigerator, W. D. Grant.......... 309,221
Refrigerator, J. Saurer.......... 309,496
Register. See Cash register.
Regulator. See Gas regulator. Heat regulator.
Rein holder, C. C. Barr.......... 309,184
Ring. See Knife ring. Lap ring.
Rivet, T. J. Wood.......... 309,430
Roofing machine, H. A. Leher.......... 309,472
Roofing, metallic, M. F. Hamsley.......... 309,459
Rotary engine, J. C. Edmunson.......... 309,296
Sad iron, Haas & Mark.......... 309,346
Sampling casks, apparatus for, G. D. W. Lennon.. 309,232
Sand drier, G. H. Campbell.......... 309,195
Sash holder, J. F. Hamilton.......... 309,300
Saw handle, W. H. Hankin, Jr.......... 309,388
Saw, pruning, H. G. Emens.......... 309,448
Screw cutting die, F. D. Mayo.......... 309,237
Seed drill feed box, W. P. Elam.......... 309,447
Seeding machine coverer attachment, J. D. Otstot.......... 309,403
Separator. See Grain separator.
Sewing machine bobbin winder, A. V. Abercrombie.......... 309,371
Sewing machine, button, L. J. Driscoll.......... 309,209
Sewing machine trimming attachment, E. M. Hewson.......... 309,461
Sewing machines, tension apparatus for straw hat and other, C. H. Willcox.......... 309,514
Sewing on buttons, mechanism for, L. J. Driscoll. 309,210
Shelving, adjustable and portable, B. F. Roberts.. 309,380
Skate fastening, C. C. De Camp.......... 309,380
Skate, roller, S. R. & A. E. Rust.......... 309,254
Skate, roller, G. A. Welander.......... 309,501
Skate wheel, roller, S. R. Rust.......... 309,253
Skates, self-lubricating roll for roller, W. E. Badger.......... 309,373
Smoke consuming furnace, J. W. Hubber.......... 309,226
Snow plow, J. M. Williams.......... 309,275
Soldering iron, A. F. Zimmerling.......... 309,280, 309,281
Spoon, J. W. Calef.......... 309,437
Spring jack switch, R. V. Freeman.......... 309,218
Stave dressing machine, G. J. Fritz.......... 309,341
Stave packer, J. Tomlinson.......... 309,421
Steam boiler, B. F. Mohr.......... 309,484
Steam boiler flue cleaner, J. Cocker.......... 309,377
Steam brake, Taylor & Sutherland.......... 309,261
Steam cylinders, withdrawing water of condensation from, C. C. Worthington.......... 309,277
Steam generator, B. T. Babbitt.......... 309,282
Steam generators, apparatus for cleaning, B. T. Babbitt.......... 309,283
Steel and steely iron, manufacturing articles of, S. Johnston.......... 309,507
Steel, hardening, L. B. Rockwell.......... 309,492
Stopper. See Tube stopper.
Store service apparatus, M. Clark.......... 309,198, 309,199
Store service system, M. Clark.......... 309,197, 309,200, 309,201
Stove drum, B. F. Myers.......... 309,486
Suspenders, J. A. Stuart.......... 309,321
Switch. See Spring jack switch.
Tag, S. Herzberg.......... 309,390
Tag and fastener, M. Alshuler.......... 309,372
Tedder tooth, R. W. Dixon.......... 309,443
Telegraph cables, making, W. R. Patterson.......... 309,244
Telegraph paper, winding rolls of, H. F. Clarke.. 309,332
Telephone, J. Lowth.......... 309,474 to 309,476
Telephonic apparatus, T. J. Perrin.......... 309,357
Thill coupling, H. W. King.......... 309,469
Tie. See Railway tie.
Timepiece mechanism, J. Lindauer.......... 309,306
Timepiece, twenty-four hour, H. C. Fick.......... 309,284
Tongs, tinner's H. O. Reese.......... 309,359
Tool handle, C. Carleton.......... 309,438
Torch and battle ax, combined, A. Wolf.......... 309,370
Traction wheel, J. A. Stout.......... 309,417
Trap, E. S. McClellan.......... 309,395
Tricycle, G. T. Warwick.......... 309,325
Truck, car, E. U. Benedict.......... 309,185
Truck, car, G. T. Washburn.......... 309,266
Truck, warehouse, S. Taylor.......... 309,365
Trucks, truss plate for car, S. A. Bemis.......... 309,510
Trunk, packing case, etc., G. Mortimer *et al*.......... 309,239
Tube stopper, G. Washington.......... 309,368
Turbine wheel, J. Humphrey.......... 309,227
Twist drills, machine for clearing, Stetson & Buchter.......... 309,259
Type writing machine, J. W. Cole.......... 309,378
Type writing machine, J. A. Whitcomb.......... 309,272
Valve apparatus for steam engines and pumps, H. Tenting.......... 309,418
Valve gear, Class & Schwan.......... 309,333
Valve gear, J. P. McCook.......... 309,480
Vehicle brake, Fox & Wenmoth.......... 309,217
Vehicle, side spring, W. J. Wayne.......... 309,423
Vehicle stake holder, L. D. Fuller.......... 309,298
Vehicle, two-wheeled, D. D. Weisell.......... 309,268
Velocipede wheel, E. C. F. Otto.......... 309,355
Ventilating test stations of underground cables, W. R. Patterson.......... 309,245
Wagon bolster, Z. A. Benell.......... 309,286
Wagon, side bar, G. D. Selby.......... 309,409
Washer. See Bottle washer.
Watch case, D. O'Hara.......... 309,354
Water meter, Fraser & Clark.......... 309,340
Waterproof fabric, F. E. Hall.......... 309,456
Water tube boiler, E. J. Moore.......... 309,352
Wear hook for back pad billets, O. A. Dean.......... 309,379
Weather strip, Smith & Schwartz.......... 309,413
Weed cutter, R. Ford.......... 309,452
Wheat cleaning and grading machine, M. Forder. 309,216
Wheel. See Traction wheel. Turbine wheel. Velocipede wheel. Wheelbarrow wheel.
Wheelbarrow wheel, W. J. Bruce.......... 309,193
Wick raiser and trimmer for lanterns, T. M. McLeod.......... 309,481
Windlass, L. W. Post.......... 309,314
Windlass, capstan, B. G. Luther.......... 309,477
Wire, compound, Chillingworth & Russell.......... 309,439
Wire, compound, Paul & Wood.......... 309,509
Wire, manufacture of compound, I. A. & M. D. Kilmer.......... 309,468
Wire springs, machine for bending, G. Dentgen... 309,295
Wool, etc., process of and apparatus for scouring and washing, E. Patry.......... 309,312
Wrench, W. P. Heffron.......... 309,389
Wringer. See Clothes wringer.

DESIGNS.

Air grate or ventilator, S. H. Lighton.......... 15,618
Bottle, M. W. Michell.......... 15,620
Bottle, caster, W. H. Lum.......... 15,619
Carpet, H. Horan.......... 15,614 to 15,616
Costume, child's, C. O'Hara.......... 15,621
Dish, C. E. Haviland.......... 15,629, 15,630
Dish for table ware, C. E. Haviland.......... 15,627
Dish handle, C. E. Haviland.......... 15,628
Organ case, J. F. Volz.......... 15,624
Pendant, B. Dreyfus.......... 15,612
Range, cooking, I. A. Sheppard.......... 15,623
Sand band cap, J. S. Newland.......... 15,625
Shoe clasp tongue, J. L. Thomson.......... 15,626
Spoon or fork handle, G. W. Hull.......... 15,617
Stove, heating, W. C. Higgins.......... 15,613
Tag holder or fastener, W. E. Preble.......... 15,622
Vinaigrette, H. F. H. Bothe.......... 15,611

TRADE MARKS.

Alloy resembling silver, Silver Metal Manufacturing Company.......... 11,801
Calf's foot jelly, H. & E. Humbert.......... 11,806
Carpets, rugs, and mats, certain, J. Crossley & Sons.......... 11,781
Cement, Knight, Bevan & Sturge.......... 11,787
Ceramic designs adapted to be framed, certain, J. G. & J. F. Low.......... 11,790
Cod-liver oil, Lanman & Kemp's pure, Lanman & Kemp.......... 11,810
Coffees of all kinds, W. F. McLaughlin.......... 11,797
Cotton cloths, Hyde & Burton.......... 11,786
Cotton goods, both brown and bleached, plain and twilled, Laconia Company.......... 11,789, 11,790
Culinary pots, kettles, stew-pans, etc., Capital City Malleable Iron Company.......... 11,779
Disinfectants and moth destroyers, W. H. H. Childs.......... 11,780
Grape vines, Niagara white, Niagara White Grape Company.......... 11,799
Inks, marking and writing, Kosmian Manufacturing Company.......... 11,788
Knives, forks, and spoons, Gebrueder Noelle.......... 11,800
Leather, burnishing or polishing composition for finishing, J. H. Dwyer.......... 11,783
Liniment, G. H. Becks.......... 11,775
Medicinal preparations, certain, Lanman & Kemp. 11,809
Medicinal preparations for coughs and colds, fluid, C. A. Vogeler Co.......... 11,804
Medicine for disordered liver, rheumatism, neuralgia, and fever and ague, Cullen & Newman.... 11,782
Medicine for the cure of diseases of the bowels, M. M. Lamontagne.......... 11,791
Medicine for the cure of diseases of the eye, M. M. Lamontagne.......... 11,793
Medicine for the cure of diseases of the organs of respiration, M. M. Lamontagne.......... 11,792
Oils and grease for machines, firearms, etc., Boulard, Bucquet & Co.......... 11,777
Ointment, E. Burgess.......... 11,778
Oranges and lemons, A. Minaldi.......... 11,811
Padlocks, H. F. Sise.......... 11,802
Pills, J. F. Smith & Co.......... 11,803
Pills, Bristol's sugar-coated, Lanman & Kemp.......... 11,807
Remedies, chill, E. S. Hale.......... 11,805
Remedy for bad digestion, G. Leisander.......... 11,794
Rubber cloth, textile fabrics composed partly of rubber, and enamel cloth, S. M. Freeley.......... 11,784
Rubber compound used for insulating wire and for other purposes, New York Insulated Wire and Vulcanite Company.......... 11,798
Sarsaparilla, Bristol's, Lanman & Kemp.......... 11,808
Silks in spools or reels, colored with certain dyes, J. Besancon, Aine.......... 11,776
Skates of all kinds, roller, S. W. Alward.......... 11,774
Starch for laundry use, Glen Cove Starch Manufacturing Company.......... 11,785
Tobacco, smoking, Marburg Bros.......... 11,796

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, at a cost of $40 each. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

INSURANCE Co. HARTFORD CONN.
CASH CAPITAL $4,000,000
LOSSES PAID IN 66 YEARS $56,000,000
The Largest and Strongest Company.
L. J. HENDEE, PRES'T. J. GOODNOW, Sec'y. WM. B. CLARK, Ass't Sec'y.

INTERNATIONAL INVENTIONS EXHIBITION.
LONDON, 1885.

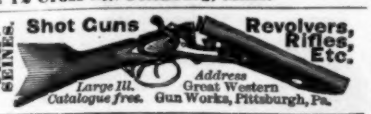
Patron: Her Majesty the Queen. President: His Royal Highness, the Price of Wales.

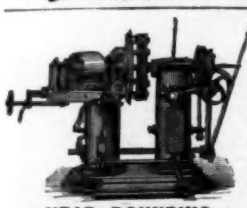
American applications received until the 31st of January, 1885.

NO CHARGE FOR SPACE.

Special Agent, J. PIERREPONT EDWARDS, British Consul, New York.

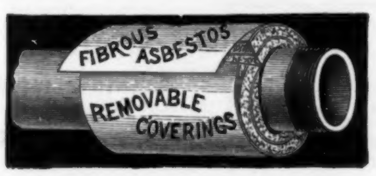
2 TELEPHONES $3.50. Send for circulars. Fitchburg Acoustic Telephone Co., 12 Cross St., Fitchburg, Mass.

FISH SEINES. Shot Guns Revolvers, Rifles, Etc.

Large Ill. Catalogue free. Address Great Western Gun Works, Pittsburgh, Pa.

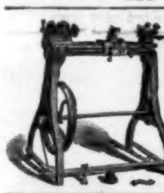

HEAD ROUNDING.

BARREL, KEG, HOGSHEAD, AND Stave Machinery. Over 50 varieties manufactured by E. & B. HOLMES, Buffalo, N. Y.

PIPE COVERING.



Fireproof Non-conducting Coverings for Steam Pipes, Boilers, and all hot surfaces. Made in sections three feet long. Easy to apply. Asbestos Materials—Fiber, Millboard Packing, and Cement.
CHALMERS-SPENCE CO.
419-421 Eighth St., New York.



SEBASTIAN, MAY & CO.'S. IMPROVED $60 Screw Cutting Lathe. Designed for actual work; no toy. Lathes for wood or metal. Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application. 185 & 187 W. Pearl St., Cincinnati, Ohio.

FIRE BRICK. TILE AND CLAY RETORTS ALL SHAPES. BORGNER & O'BRIEN. 23RD ST. ABOVE RACE, PHILADELPHIA.

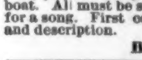
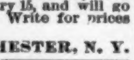
ELECTROLYTIC FIGURES. — A DEscription, with nine illustrations, of the various curious crystalline ramifications obtained by Cardani through the electrolysis of a solution of nitrate of silver. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 426. Price 10 cents. To be had at this office and from all newsdealers.

FOR SALE CHEAP.

Shipman Engine No. 2; two horse power, and the following Patent Velocipede foot power machines made by W. F. and Jno. Barnes: No. 2 Scroll Saw, Lathe No. 4 for wood or metal, and a Patent Former.

The Engine is very small and light, using kerosene as fuel; just the thing for running light machinery or a boat. All must be sold before February 15, and will go for a song. First come, first served. Write for prices and description.

BOX 244, ROCHESTER, N. Y.

FREE TO ANY LADY

reader of this paper who will agree to show our catalogue and price list of Rubber Goods to their friends and try to influence sales for us. We will send you free, post-paid two full sized, LADIES' GOSSAMER RUBBER WATER PROOF GARMENTS, as a sample, and one of our handsome Colored Covers 44 page Catalogues with wholesale price list showing how you can make a nice profit right at home. Send 20 cents for postage, packing, &c., (stamps or silver taken.) Cut this out and send it to

B. A. BABCOCK & CO., CENTERBROOK, CONN.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

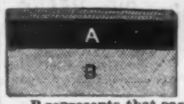
In this line of business they have had *thirty-eight years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents, 361 Broadway, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.



RUBBER BACK SQUARE PACKING.
BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

NEW YORK BELTING & PACKING CO.,
JOHN H. CHEEVER, Treas. JOHN D. CHEEVER, Dep'y Treas. Nos. 13 & 15 PARK ROW, Opp. ASTOR HOUSE, NEW YORK. Branches: 308 Chestnut St., Philadelphia. 151 Lake St., Chicago. 52 & 54 Summer St., Boston.

A MAGIC LANTERN ELECTRIC ENGINE MUSICAL BOX or STEAM ENGINE **FREE**
For particulars how to SECURE ONE and Mammoth Catalogue of Magic Lanterns and Organettes, all latest styles, also Wonderful Novelties. Address, HARBACH ORGAN CO., Philadelphia, Pa. MAGIC LANTERNS WANTED.

PHONOGRAPHY, or Phonetic Short Hand, Catalogue of works by Benn Pittman and Jerome B. Howard, with alphabet and illustration for beginners sent on application. Address
PHONETIC INSTITUTE, Cincinnati, Ohio.

THE CELEBRATED RACINE BOATS and CANOES, ALSO ALL KINDS OF LAPSTREAK BOATS.
We build to order anything in the boat line.
THOS. KANE & CO., (BOX F.) 137 and 139 Wabash Ave., CHICAGO.

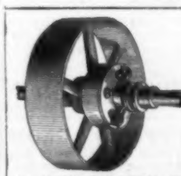
•NEW•
New Designs, New Scroll Saws, New Premium Offers. Send 15c. for this new and beautiful CURFEW BRACKET pattern, 10 x 18, and a large number of new miniature designs for Scroll Sawing, or send 6c. for new Illustrated Catalogue of Scroll Saws, Lathes, Fancy Woods, Mechanics' Tools, Small Locks, Fancy Hinges, and Catches for Scroll work, Clock Movements, &c. Great Bargains in POCKET KNIVES. Greater inducements in way of Premiums etc., for season of 1885 than ever before. A. H POMEROY, 216-220 Asylum St. HARTFORD, CONN. ☞ Mention this paper.

SOUTHWARK FOUNDRY & MACHINE COMPANY, 430 Washington Ave. Philadelphia, ENGINEERS & MACHINISTS. BLOWING ENGINES AND HYDRAULIC MACHINERY. SOLE MAKERS OF THE PORTER ALLEN & SOUTHWARK AUTOMATIC CUT OFF STEAM ENGINE.

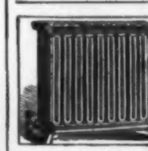
HOUSE DRAINAGE AND REFUSE.—Abstract of a lecture by Capt. Douglas Galton, C.B., on the treatment of town, barrack, and camp refuse, and on the removal of excreta from houses. A valuable paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 421. Price 10 cents. To be had at this office and from all newsdealers. The same number contains a valuable paper on the construction of privy vaults. Illustrated with three engravings.

THE HARDEN STAR HAND GRENADE FIRE EXTINGUISHER
Puts Out Fire Instantly.
See editorial notice in SCIENTIFIC AMERICAN of November 22d, 1884. Send for circulars. Address
Harden Hand Grenade Fire Extinguisher Co.,
205 Wabash Ave., Chicago, 10 Oliver St., Boston, or 95 West Broadway, New York.

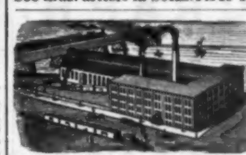
ELECTRO-MAGNETISM AS A PRIME Mover.—An account of the various attempts that have been made to utilize electro-magnetic power as a prime mover. Schulthess' machine. Salvator dal Negro's apparatus. Jacobi's apparatus. Davidson's apparatus. Devenport's devices. Capt. Taylor's electro-magnetic engine. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 359. Price 10 cents. To be had at this office and from all newsdealers.



F. Brown's Patent FRICTION CLUTCH.
Send for Illustrated Catalogue and Discount Sheet to
A. & F. BROWN, 43 Park Place, New York.
SHAFTS PULLEYS HANGERS



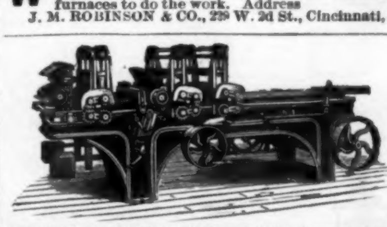
A. A. GRIFFING IRON CO. STEAM HEATING Apparatus. SOLE MANUFACTURERS BUNDY STEAM RADIATOR. 750 COMMUNIPAW AVE. JERSEY CITY, N.J.
See illus. article in SCIENTIFIC AMERICAN Sept. 13, 1884.



BARNES' Patent Foot and Steam Power Machinery. Complete outfits for Actual Workshop Business. Lathes for Wood or Metal Circular Saws, Scroll Saws, Formers, Mortisers. Tenoners, etc., etc. Machines on trial if desired. Descriptive Catalogue and Price List Free. W. F. & JOHN BARNES, No. 1999 Main St., Rockford, Ill.

THE PUSEY & JONES CO Builders of all description of machinery used by manufacturers of Paper.
WILMINGTON, DELAWARE.

WANTED. A man thoroughly competent to temper delicate springs, also to superintend the construction of the necessary furnaces to do the work. Address
J. M. ROBINSON & CO., 229 W. 2d St., Cincinnati, O.



WITHERBY, RUGG & RICHARDSON. Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

HOW TO COLOR LANTERN TRANSPArencies.—A valuable paper by T. J. Houston giving full directions for the preparation of photographic transparencies, and for painting them. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 423. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an illustrated paper on Improvements in Photo-block Printing.—Another valuable paper on the Preparation on Lantern Transparencies is contained in SUPPEMENT, No. 424.

WATCHMAKERS.
Before buying, see the Whitcomb Lathe and the Webster Foot Wheel, made by the AMERICAN WATCH TOOL CO., Waltham, Mass. CATALOGUES FREE.

LOVE COURTSHIP and MARRIAGE. Wonderful secrets, revelations and discoveries for married or single, securing health, wealth and happiness to all. This handsome book of 160 pages, mailed for only 10 cents by the Union Publishing Co., Newark, N. J.

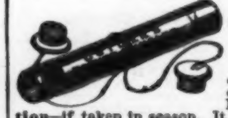
ICE-BOATS — THEIR CONSTRUCTION and management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, M.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sailing and management of ice-boats. Price 10 cents.

PERFECT
NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, 59. Price 10 cents. To be had at this office and of all newsdealers.

CUTLER'S POCKET INHALER AND *Carbolate of Iodine* INHALANT.



A cure for Catarrh, Bronchitis, Asthma, and all diseases of the Throat and Lungs—even Consumption—if taken in season. It will break up a Cold at once. It is the King of Cough Medicines. A few inhalations will correct the most Offensive Breath. It may be carried as handily as a penknife, and is guaranteed to accomplish all that is claimed for it.

As a *preventive* it is in truth the "magical Amulet" with which one may bid defiance to *Cholera, Yellow Fever*, and all *Miasmatic* and *Infectious* diseases. It has been thoroughly tested in various hospitals and localities infected with *Malaria, Small Pox, Diphtheria*, etc., and of the great number of persons, including Physicians and Nurses, who used the INHALER as a preventive, not one is known to have been attacked with any of the diseases to which they were exposed.

Patented through the agency of the SCIENTIFIC AMERICAN in 1873, this Inhaler has since had a larger and more extensive sale than any Medical Instrument ever invented. It is the only Inhaler approved by physicians of every school, and indorsed by the standard medical journals of the world. All others in the market are either worthless substitutes or fraudulent imitations.

Over 400,000 in use.
Sold by Druggists for $1.00. By mail, $1.25.
W. H. SMITH & CO., PROP'S,
410 Michigan St., Buffalo, N. Y.

RIPON CATHEDRAL. — FULL PAGE illustration and brief description of this ancient English ecclesiastical structure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 335. Price 10 cents. To be had at this office and from all newsdealers.

WATER.
Cities, Towns, and Manufactories
Supplied by GREEN & SHAW]
PATENT TUBE AND GANG WELL SYSTEM.
Wm. D. Andrews & Bro., 233 Broadway, N. Y.
Infringers of above patents will be prosecuted.

APPARATUS FOR ELECTRICAL MEASurements.—Illustrations and description of the various interesting apparatus for measuring electricity that were shown at the Munich Exhibition, including Wiedemann's bifilar galvanometer; Wiedemann's galvanometer for strong currents; Zenger's differential photometer; Von Beetz's solenoid; apparatus for demonstrating the principle of the Gramme machine; Van Rysselberghe's thermometrograph; Von Beetz's chronograph; and Harlacher's apparatus for studying deep currents. Illustrated with seventeen engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 421. Price 10 cents. To be had at this office and from all newsdealers.

REID'S LIGHTNING BRACE — SPECIALLY DESIGNED FOR LIGHT BORING, SCREW DRIVING &c. NICKEL PLATED, WITH 2 BITS ROSEWOOD TRIMMINGS — 2.75 POST PAID. A. H. REID. 1635 BARKER ST. PHILA. Agents Wanted.

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers, CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 22 Cortland St., 9 Dey St., COOKE & CO., Selling Agts., 22 Cortland Street, JAS. BEGGS & CO., Selling Agts. 9 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

OPTICAL GOODS
Microscopes, Telescopes, Field and Opera Glasses, Magic Lanterns, etc.; also, Barometers, Thermometers, Compasses, Batteries, Drawing, Drainage, Dairy, and other Scientific Instruments. 192-pp. *Catalogue free.* PRENTICE & SON, Mfg Opticians, 176 B'way, NY.

THE CORINTH CANAL.—A DESCRIPtion of the project of Mr. B. Gerster, engineer in chief of the International Corinth Canal Company, and a sketch of the progress thus far accomplished. Nature of the Isthmus of Corinth. Former undertakings. Route selected by Mr. Gerster. Mode of excavating. Apparatus employed. Illustrated with 6 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 425. Price 10 cents. To be had at this office and from all newsdealers.

The New Catalogue of Valuable Papers contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, N. Y.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS. FINE TINNING JAPANNING AND FINISHING. THOMAS DEVLIN & CO. LEHIGH AVE & AMERICAN ST. PHILA.

FRET SAW OR BRACKET WOODS,
IN CHOICE AND RARE VARIETY,
PLANED READY FOR USE.
ALSO LATEST BOOKS OF DESIGNS.
GEO. W. READ & CO.,
Manufacturers Mahogany and other Cabinet Woods.
186 to 200 LEWIS ST., N. Y.

Clark's Steel Cased Rubber Wheel, FOR ROLLER SKATES.
For use in dwellings, public halls, etc. Will not chip or injure common floors. Noiseless. Genl. Agent, H. C. Henley Skate Mfg., Richmond, Ind.

Syracuse Malleable Iron Works

Nervous Debility Quick permanent cure. Book free. Civiale Agency, 160 Fulton St., N. Y.

Free TRIAL. Send for NERVITA, a certain cure for Nervous Debility, Lost Manhood, from any cause. Trial package mailed for 12 cts. Dr. A. G. OLIN, Box 242, CHICAGO, ILL.

OPIUM & WHISKY HABITS cured with Double Chloride of Gold. We challenge investigation. 10,000 Cures. Books free. The LESLIE E. KEELEY CO. DWIGHT, ILL.

FOREIGN PATENTS.
Their Cost Reduced.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced, the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad.

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India, Australia, and the other British Colonies.

An experience of THIRTY-EIGHT years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and othe information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, MUNN & CO.,
Publishers and Patent Solicitors,
361 Broadway, New York.
Branch Office, cor. F and 7th Streets, opposite Patent Office Washington, D. C.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The "MONITOR."
A NEW LIFTING AND NON-LIFTING INJECTOR.

Best Boiler Feeder in the world. Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.

Also Patent **EJECTORS** OR **Water Elevators,** For Conveying Water and Liquid. Patent Oilers, Lubricators, etc.

NATHAN MANUFACTURING COMPANY,
Send for catalogue. **92 & 94 Liberty St., New York.**

TELEPHONES.

The United States Telephone Mfg Co.

This Company is the owner of the patents of James W. McDonough for speaking telephones.

Mr. McDonough's application for patent was the first that was made in the U. S. Patent office for a speaking telephone; all other telephones are an infringement of these patents. This Company also owns patents covering a complete system of telephone exchanges.

All telephones obtained except from this Company or its authorized licensees are infringements, and the makers, sellers, and users will be proceeded against.

This Company are now prepared to sell Telephones of the most improved form.

For particulars apply to

The United States Telephone Manufacturing Co.,
187 BROADWAY N. Y.

DRAWING INSTRUMENTS. Illustrated catalogue sent on application to WM. T. COMSTOCK, 6 Astor Place, New York.

H. W. JOHNS' ASBESTOS
LIQUID PAINTS
ROOFING.

Fire-proof Building Felt,

Steam Pipe and Boiler Coverings, Steam Packing, Mill Board, Gaskets, Sheathings, Fire-proof Coatings, Cement, &c.

DESCRIPTIVE PRICE LIST AND SAMPLES FREE.

H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.
170 N. 4th St., Phila. 45 Franklin St., Chicago.

A FIRST-CLASS MECHANIC, with good executive capacity, with some of his own inventions of articles that can be sold readily to hardware or house-furnishing goods trade, can learn of an advantageous opening as partner and superintendent of another established business having more power, machinery, and room than needed at present, by addressing
BOX 158, BUFFALO, N. Y.

Rider's New and Improved
COMPRESSION
Hot Air Pumping Engine
New and Improved Designs.
INTERCHANGEABLE PLAN
MANUFACTURED BY
DELAMATER IRON WORKS,
C. H. DELAMATER & Co., Proprietors,
No. 16 CORTLANDT ST., NEW YORK, N. Y.
And 40 Dearborn Street Chicago, Ill.

Emerson's New Book of SAWS — More than 100 illustrations, 112 pages. Every rule given that will enable its Readers to overcome all difficulties, and Sawyers instructed in hanging, truing, Or straightening and running all kinds of Never failing of success. Now ready for Send your full address to [FREE distribution.] Emerson, Smith & Co. (Ltd.), Beaver Falls, Pa.

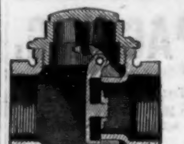
A W SAWS A W 50,000 New Edition

WM. A. HARRIS,
Providence, R. I. (Park St.), Six minutes' walk West from station.
Original and Only Builder of the
HARRIS-CORLISS ENGINE,
With Harris Pat. Improvements, from 10 to 1,000 H. P.
Send for copy Engineer's and Steam User's Manual. By J. W. Hill M.E. Price $1.25.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by EAGLE ANVIL WORKS only, Trenton, N. J.

WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.

We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first-class planer in the market. ROWLEY & HERMANCE, Williamsport, Pa.



BURNHAM'S SELF-ADJUSTING SWING CHECK VALVE.

Users of Check Valves will please note the advantage these Valves possess over all others. The most **important claim** is, that as the **Jenkins' Disk wears, the yoke that passes around the seat moves away from the seat in proportion to the wear of the Disk, thus causing a uniform wear of the Disk until said Disk is completely worn out.**

JENKINS BROS.,
71 John Street, New York. Send for Price List "A." **79 Kilby St., Boston.**

AGENTS:
Rees, Shook & Co., Pittsburg, Pa. Gibson & Clark, Cincinnati, Ohio. Chafer & Becker, Cleveland, Ohio. Dunham, Carrigan & Co., San Francisco, Cal. Ahrens, Welker & Ryan, Louisville, Ky. James Walker & Son, Detroit, Mich. Weir & Craig, Chicago, Ill. Hendrie & Bolthoff M'f'g Co., Denver, Col. Weir & Craig, Minneapolis, Minn. Pond Engineering Co., St. Louis, Mo. Marinette Iron Wks. Co., Chicago, Ill. English Brothers, Kansas City, Mo.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

(Descriptive catalogues forwarded on application.)

Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.

Information furnished upon application.

Address all communications to the

AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

SUPPLIES FROM HYDRANT PRESSURE, the cheapest power known. Invaluable for blowing Church Organs, running Printing Presses, *Sewing Machines in Households,* Turning Lathes, Scroll Saws, Grindstones, Coffee Mills, Sausage Machines, Feed Cutters, *Electric Lights,* Elevators, etc. It needs little room, no firing up, fuel, ashes, repairs, engineer, explosion, or delay, no extra insurance, no coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lb.; at 40 lb. pressure has 4-horse power, and capacity up to 10-horse power. Prices from $15 to $300. Send for circular to THE BACKUS WATER MOTOR CO., Newark, N. J.

TELEGRAPH.

Instruments, Batteries, Magnets, Wire, Electric Bells, and Electric Apparatus and Supplies of every description. Large illustrated catalogue mailed free. Manual of Telegraphy with instructions for learners, and for the operation of short lines of Telegraph, free to any address.
J. H. BUNNELL & CO., 112 Liberty St., N. Y.

GRATEFUL—COMFORTING.

EPPS'S COCOA.

BREAKFAST.

"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a delicately-flavored beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us, ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Civil Service Gazette.*

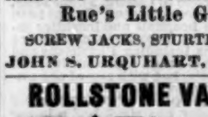
Made simply with boiling water or milk. Sold only in half-pound tins by Grocers, labeled thus:

JAMES EPPS & CO., Homœopathic Chemists,
London, England.

COMMON SENSE CHAIRS AND ROCKERS. Strong, durable, and comfortable. No light, trashy stuff, but good, honest home comforts. Special discount to clergymen. Send stamp for catalogue to
F. A. SINCLAIR,
Mottville, Onondaga, County, N. Y.
For sale by all first-class Furniture Dealers.

RAILWAY AND STEAM FITTERS' SUPPLIES.
Rue's Little Giant Injector.
SCREW JACKS, STURTEVANT BLOWERS, &c.
JOHN S. URQUHART, 46 Cortlandt St., N. Y.

ROLLSTONE VARIETY LATHE.

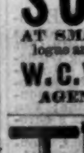


Latest improved. Rotary and Stationary Bed Planers and Buzz Planers; Band Saws; *Wardwell's Patent Saw Bench* Dowel Machine; Chair Machinery; Boiler Machines, etc. *Also large Stock of Second hand Machinery always on hand.* Send for catalogue, and state just what you want to ROLLSTONE MACHINE Co., 48 Water St., Fitchburg, Mass.

Beautiful & Lasting for ORNAMENTING WINDOWS, DOORS, TRANSOMS, &c.

Stained Glass SUBSTITUTE

AT SMALL COST. Send for Illustrated Catalogue and Prices. Samples by mail 25 cents.
W. C. YOUNG SOLE AGENT, 731 ARCH ST. PHILADELPHIA, PA.
AGENTS WANTED EVERYWHERE.



HOLLAND'S OPENWAY VALVE.

The desirable features of this valve are the positive action of the disks, being forced against the seats by our novel intermediate wedge, avoiding all cutting and friction of the disks against the seat.

Samples sent on trial. Send for Catalogue.
HOLLAND & THOMPSON,
217 RIVER STREET, TROY, N. Y.

GASKILL'S STEAM PUMPS,
AND
GASKILL'S HIGH DUTY PUMPING ENGINES.
For public water supply. Manufactured by
THE HOLLY MFG. CO., Lockport, N. Y.

KORTING UNIVERSAL INJECTOR

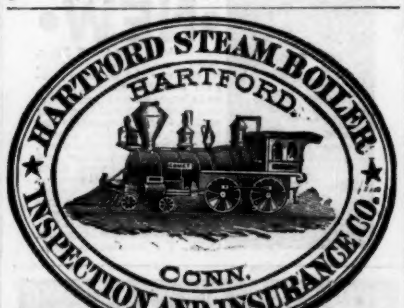
DOUBLE TUBE.

ALL BRASS

FOR BOILER FEEDING.
Operated by one handle.
WILL LIFT HOT WATER.
POSITIVE ACTION GUARANTEED UNDER ALL CONDITIONS.
NO ADJUSTMENT FOR VARYING STEAM PRESSURE.
WILL LIFT WATER 25 FEET. SEND FOR DESCRIPTIVE CIRCULAR.

OFFICES AND WAREROOMS:
Philada., 12th & Thompson Sts. Boston, 61 Oliver St. Augusta, Ga., 1026 Fenwick St. San Francisco, Cal., 2 California Street. New York, 109 Liberty Street. Denver, Col., 438 Blake Street. Chicago, Ill., 204 Lake St.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Maine.



THE PAYNE AUTOMATIC ENGINE
Gives more power from same amount of fuel and water than any engine

made, and 50 per cent more power than rated at. All engines warranted. All sizes and styles, 2 to 250 horse power. Send for prices and catalogue A 4.
B. W. PAYNE & SONS,
P. O. Box 1207. Elmira, N. Y.

NOTICE to Users of Steam Pumps.
We have received following letter in regard to one of our No. 5 "L" ($16) Steam Jet Pumps elevating 1¼ inch pipe of water more than 50 feet high:

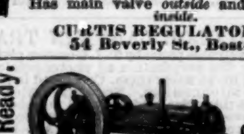
"L'ANSE, MICH., Feb. 24, 1883.
"VAN DUZEN & TIFT, Cincinnati, O.:
"Money could not buy the Jet of us unless another could be had. I would not give your No. 5 "L" for a $700 pump, equal distance to raise.
"N. A. Litchfield, Supt. Mich. Slate Co."

We make Ten Sizes of these Pumps. Prices $7 to $75. Capacities 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

Curtis Pressure Regulator,
FOR STEAM AND WATER,
Is made entirely of Metal. Occupies the same space as a Globe Valve. It has no glands or packing, and is a lock-up valve.

CURTIS STEAM TRAP
Has main valve *outside* and air valve *inside.*
CURTIS REGULATOR CO.,
54 Beverly St., Boston, Mass.

Gas Engines, ½ & 1 H. P., Now Ready.



For Power or For Pumping

GAS ENGINES.

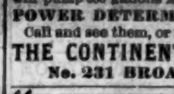
Simple, Substantial, Safe, Economical.

One horse power will pump 1,000 gallons of water 100 feet high per hour with 25 feet of gas. One-half horse power will pump 500 gallons 100 feet high with 25 feet of gas.

POWER DETERMINED BY ACTUAL TEST.

Call and see them, or for circulars and prices address
THE CONTINENTAL GAS ENGINE CO.,
No. 231 BROADWAY NEW YORK.

"LINENE" Reversible Collars & Cuffs.
Rubens, Angelo, Raphael. New standing style, Murillo



Several webs of *Fine Muslin, starched together* form the FABRIC. Polished both sides. Linene collars and cuffs have no wrong side. Ten for 25 cts. at stores, or by mail, *to try.* Two Gold Medals awarded at M. C. M. A. Fair, Boston, 1881. Collar and pair cuffs, any size, postpaid, for SIX cts. Circulars free. Reversible Collar Co., Factory, Cambridge, Mass.

EMPIRE OF BRAZIL.
PROPOSALS
FOR THE ILLUMINATION OF THE CITY OF RIO DE JANEIRO BY GAS.

By order of the Imperial Government it is made public that proposals for the illumination of the city of Rio de Janeiro by gas will be received up to 3 P. M. of February 28, 1885, at this Legation and at the Brazilian Consulate General in New York. Specifications and general conditions will be furnished on application at the same places.
Washington, November 11, 1884.
J. G. do AMARAL VALENTE,
Chargé d'Affaires of Brazil

BOOKWALTER ENGINE.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

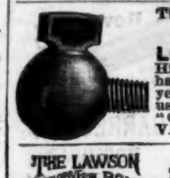
3	HORSE POWER	....	$240 00
4½	" "	....	280 00
6½	" "	....	355 00
8½	" "	....	440 00

Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.



The most successful Lubricator for Loose Pulleys in use.
VAN DUZEN'S PATENT
LOOSE PULLEY OILER.
Highly recommended by those who have used them for the past two years. Prices very reasonable. Every user of machinery should have our "Catalogue No. 55;" sent free.
VAN DUZEN & TIFT, Cincinnati, O.

This is the only steam boiler ever devised in strict compliance with the demands of natural laws. It gives complete immunity against explosions, delivers dry steam, prevents all incrustation and deposit on the bottom plates, affords safety with high pressure, and secures great economy. The invention is applicable to every style of boiler, and can be readily applied, internally or externally, to new or old boilers. Licenses granted on liberal terms to manufacturers. Send for description.
LAWSON NON-EXPLOSIVE BOILER CO.,
155 and 157 Broadway, N.Y.

The Scientific American.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

Published Weekly, $3.20 a Year; $1.60 Six Months.

This unrivaled periodical, now in its **fortieth year,** continues to maintain its high reputation for excellence, and enjoys the largest circulation ever attained by any scientific publication.

Every number contains sixteen large pages, beautifully printed, elegantly illustrated; it presents in popular style a descriptive record of the most novel, interesting, and important advances in Science, Arts, and Manufactures. It shows the progress of the World in respect to New Discoveries and Improvements, embracing Machinery, Mechanical Works, Engineering in all branches, Chemistry, Metallurgy, Electricity, Light, Heat, Architecture, Domestic Economy, Agriculture, Natural History, etc. It abounds with fresh and interesting subjects for discussion, thought, or experiment; furnishes hundreds of useful suggestions for business. It promotes Industry, Progress, Thrift, and Intelligence in every community where it circulates.

The SCIENTIFIC AMERICAN should have a place in every Dwelling, Shop, Office, School, or Library. Workmen, Foremen, Engineers, Superintendents, Directors, Presidents, Officials, Merchants, Farmers, Teachers, Lawyers, Physicians, Clergymen, people in every walk and profession in life, will derive benefit from a regular reading of THE SCIENTIFIC AMERICAN.

Terms for the United States and Canada, $3.20 a year; $1.60 six months. Specimen copies free. Remit by Postal Order or Check.

MUNN & CO., Publishers,
361 Broadway, New York.

THE
Scientific American Supplement.

THE SCIENTIFIC AMERICAN SUPPLEMENT is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

The most important Engineering Works, Mechanisms and Manufactures at home and abroad are represented and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Address and remit by postal order or check,

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of

MUNN & CO., 361 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp. Duane St., N. Y.